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We print in another column a summary of the protests which have been made against the equipment depreciation charges required by the Interstate Commerce Commission. In a nutshell, the situation is that the new way of providing for the obsolescence of property is not as good as the old way. Every observer of American railroads knows that physical property was a good deal more than maintained, in the series of profitable years closed temporarily last fall, but that this maintenance was not accomplished through the medium of a monthly depreciation charge. The railroads were doing the property-maintenance part of their business with conspicuous efficiency, but the Interstate Commerce Commission wants them to abandon this successful, practical method, and substitute for it a theoretical method which is open to many grave objections, and which nobody supposes will work any better than present practice. This is just the kind of case in which the American Railway Association should do constructive work, and it is encouraging to observe that it has a strong committee in the field, and that the committee has the matter actively in hand. There is no reason why the Association should not work in closest harmony with the Interstate Commission, and draw freely upon its imposing array of talented members for the common cause. It is certain that the Commission needs the services of the Railway Association, and that the Association has nothing to gain by holding aloof.

The Interstate Commerce Commission has never been suspected of being unduly friendly to private car lines. Its investigations, reports and decisions from time to time have made them a great deal of trouble. But its rulings about demurrage on private cars have given the owners a substantial advantage over competing shippers who own no cars. The uniform car service rules recommended by the American Railway Association provided in their original form that demurrage should be collected on private cars except when on the tracks of their owners. The Commission (I C C No. 933) ruled that demurrage should not be collected on private cars when on the private track of either their owner or the consignee. Later it has extended its ruling so as to apply to cars owned by private corporations and leased to shippers. Let us see how the rule as it now stands will work in practice. A consignee who receives upon his private track coal in cars owned, or leased from a private corporation, by the coal mine operator from whom the coal was bought may use the cars free as storehouses as long as the mine operator will let him. But if the same consignee receive upon his private track coal from a mine operator who does not own or lease any cars, but uses those of the railroad, the consignee must release the cars promptly on the expiration of the period of free time or pay demurrage. In these circumstances the consignee plainly will find it to his advantage to buy coal from the mine operator who can let him use cars free as storehouses indefinitely. The ruling of the Interstate Commerce Commission gives the large shipper an advantage over the small shipper that the rule of the American Railway Association denied to him.

PHYSICAL VALUATION OF RAILROADS.

According to the *New York Sun*, Professor Henry C. Adams, statistician of the Interstate Commerce Commission, in his annual report goes outside of his field as statistician and makes recommendations concerning what the Government ought to require from the railroads in the future; and the chief of these is the recommendation for legislation providing for the physical valuation of railroad property. He thinks that Congress should appropriate a sum sufficient to appraise the value of all the railroads. "From whatever point of view this question of valuation be regarded," says Prof. Adams, "whether of reasonable capitalization, a reasonable schedule of rates, effective administration of the depreciation accounts, or the correct interpretation of the balance sheet, one is forced to conclude that an authoritative valuation of railroad property is the next important step in the development of governmental supervision over railroad administration."

The object aimed at is (1) the protection of investors against secret changes by their agents, the directors, which might impair the value of stocks or bonds, and (2) the protection of the public against high fares and freight rates. Whether any such protection of investors actually would be afforded, or whether, if some benefit of the kind should accrue, it would be worth a tithe of what it would cost the people in taxes, are apparently questions too remote to receive consideration in this academic discussion. Admitting that here and there a valuation might bring out facts which some unfaithful board of directors had wrongfully concealed, it is entirely probable that all the useful results could be obtained by any vigorous governmental agency at a mere fraction of the cost of a valuation; but the report indicates that Professor Adams passes

over this point in silence. The fact that a valuation made to-day, at great cost, will surely be inaccurate next year, and thus will be almost useless unless repeated annually, also seems to be ignored. That railroads are continually finding themselves forced to reduce fares or freights in spite of high capital charges, is one of the patent facts of railroad history and experience, but this report gives no hint of any such fact. On the contrary it assumes that over-capitalization does directly affect rates. If the report were simply a plea for more work, more clerks and more appropriations for a government bureau it could hardly present its point more baldly.

And yet this report, having the sanction of seven eminent interstate commerce commissioners, is likely to have more weight before Congress than the opinions of practical and experienced men. It is to be confessed that this is due in considerable measure to the neglect of practical and experienced men to discuss subjects of this kind from a high and impartial standpoint, for the benefit of the public; which emphasizes the importance of the proposed action in the American Railway Association looking to the establishment of unbiased, authoritative sources of information on transportation topics.

In contrast with this purely theoretical treatment of an important subject it is of interest to read what was said on the same subject by Judge Taft in his speech at Cincinnati a month ago accepting the nomination for the presidency. The speech of a presidential candidate is almost of necessity saturated with political expediency and we are not holding up Judge Taft's proposals for approval. Indeed, he makes manifest his unfamiliarity with the subject, and speaks with the utmost caution at every point. As might be expected, he shows a strong desire to please the radical element if it shall be found possible to do so without straining right principles or doing injustice to important interests. But Judge Taft is a man of long experience in practical affairs, and he perceives that the question of valuation is a complicated one; and, for our part, we are disposed to read, in his letter, *between the lines*, the views of a man who sees the folly of wasting millions of dollars on a work which may possibly result in saving thousands, and all for no higher purpose than to please critics, who, in their disappointment at their inability to "get even" with the railroads by rational processes, are grasping at any and all methods, rational or irrational, which promise even partially to accomplish their object.

We quote from Judge Taft's letter, as before stated, for the purpose of showing the position of a cautious and judicial minded student of the subject:

> It is clear that the physical value of a railroad and its plant is an element to be given weight in determining its full value; but the value of the railroad as a going concern, including its good will, due to efficiency of service and many other circumstances, may be much greater than the value of its tangible property, and it is the former that measures the investment on which a fair profit must be allowed. Then, too, the question what is a fair profit is one involving not only the rate of interest usually earned on normally safe investments, but also a sufficient allowance to make up for the risk of loss both of capital and interest in the original outlay. The question of rates and the treatment of railroads is one that has two sides. The shippers are certainly entitled to reasonable rates; but less is an injustice to the carriers. . . . The proper conclusion would seem to be that in attempting to determine whether the entire schedule of rates of a railroad is excessive, the physical valuation of the road is a relevant and important but not necessarily a controlling factor. . . . I believe that the normal increase in the value of railroad properties, especially in their terminals, will more than make up for the possible overcapitalization in earlier years. In some cases, doubtless, it will be found that overcapitalization is made an excuse for excessive rates, and then they should be reduced; but the consensus of opinion seems to be that the railroad rates generally in this country are reasonably low. . . . Of course, in the determination of the question whether discrimination is unlawful or not, the physical valuation of the whole road is of little weight. . . . Valuation by the Interstate Commerce Commission of the tangible property of a railroad is proper and may from time to time be necessary in settling certain issues which may come before them, and no evil or injustice can come from valuation in such cases, if it be understood that the result is to be used for a just purpose, and the right to a fair profit under all the circumstances of the investment is recognized. The Interstate Commerce Commission has now the power to ascertain the value of the physical railroad property, if necessary, in determining the reasonableness of rates. If the machinery for doing so is not adequate, as is probable, it should be made so.
>
> The Republican platform recommends legislation forbidding the issue in the future of interstate railroad stocks and bonds without Federal authority. It may occur in such cases that the full value of the railroad, and as an element thereof, the value of the tangible property of the railroad, would be a relevant and important factor in assisting the proper authority to determine whether the stocks and bonds to be issued were to have proper security behind them, and in such case, therefore, there should be the right and machinery to make a valuation of the physical property.

ADVANCES IN MINIMUM CAR LOAD WEIGHTS.

The Official Classification Committee, at a meeting a year ago, made advances in the minimum car load weights of almost 1,300 commodities. The Western Classification Committee, at its recent meeting at Manitou, Colo., made advances in about 900 minimum weights. The Southern Classification Committee met on September 11 to consider the question of making similar advances, and no doubt a large number of raises in minima in Southern territory will result. This movement throughout the country for a general increase in carload minima has been much needed. The railroads for some years have been rapidly increasing the capacity of freight cars. There has been a substantial, but a far from proportionate, increase in the average freight car load. The American Railway Association, in a standing resolution adopted in 1903, recorded its opinion that minimum car loads should be, as fast as practicable, increased to the stenciled capacity of cars. Most traffic officers have willingly subscribed to this principle; but often they have differed from operating officers as to how fast advances were practicable. Between the pressure of the operating departments for heavier loading, and the resistance of many shippers to increases in minima, the traffic departments have made but slow progress.

The figures showing the changes made by the Western Classification Committee (*Railroad Age Gazette*, September 4, p. 882) indicate that there must be much more progress along this line before the railroads will get the practicable maximum of benefit from their large and costly freight cars. The average capacity of all the freight cars in service in the United States in the year ended June 30, 1906, according to the Interstate Commerce Commission, was 32 tons. This average has since been considerably increased by the scrapping of many small capacity cars and the purchase of 60,000, 80,000 and 100,000-lb. cars to take their places. Nevertheless, the highest minimum car load fixed for any commodity by the Western Classification Committee at its recent meeting, was 50,000 lbs. This was also the highest minimum fixed by the Official Classification Committee last year. It is now the highest minimum required except for commodities that load in some peculiar way. Of the almost 1,300 commodities that were advanced by the Official Classification Committee, minima of 40,000 lbs. or more were fixed for only 119, and of the 900 commodities advanced by the Western Classification Committee, minima of 40,000 lbs. or more were fixed for only 121. In both eastern and western territory 36,000 lbs. was fixed as the minimum for most ordinary commodities.

Consider, in view of these facts, the results of an examination of the equipment of 20 of the principal railroads of the United States, which was made by a member of the committee that was appointed last year to consider the feasibility of a uniform classification. This investigation showed that out of a total of 455,266 box cars on these 20 lines, 37 per cent. had a capacity equal to or greater than the standard box car (36 ft. long, cubic capacity 2,448 cu. ft., weight capacity 60,000 lbs.), and that 88 per cent. of the cars, with length varying from 30 to 40 ft., had a capacity of 1,400 cu. ft. or more. Calculations also showed that a large majority of the articles, the minima of which were then 30,000 lbs., and the minima of which are now 36,000 lbs., would load 40,000

lbs. in the 88 per cent. of the box cars that had a capacity of 1,400 cu. ft.; and of course they would load correspondingly heavier in that 37 per cent. of the cars whose capacity ranged from 1,400 cu. ft. to as much as 4,400 cu. ft. These figures show how very conservative the railroads have been in advancing minima. Not only do they in most instances still fall short of the ideal of the American Railway Association—that of having minima equal the actual capacity—but minima in a large majority of cases are still less, in many cases much less than the cubic capacities of the cars would warrant.

It has been a hard task to accomplish the increases in minima that have been made. The larger shippers have not opposed them so much as the smaller shippers. It is often a real hardship to a concern that has been barely able to ship in car loads to have the minimum car load weight of its commodity so increased that thereafter it must either pay the L.C.L. rate, or pay the C.L. rate for the transportation of perhaps 18 tons when it has only 15 tons to ship. The weaker industrial and commercial concerns are thus placed at an increased disadvantage in the struggle against their larger competitors. But the economic gain more than offsets the injury to small shippers; and hard as it may be at first, their business will be forced by circumstances into some degree of adjustment to the new conditions. Of course, freight cars, like Mr. Hill's mammoth steamships on the Pacific ocean, may, in a given locality, be made too large for the average load that can be secured (even after shippers have made all of the readjustments that they can afford to make); and so far as such circumstances are controlling, the railroads will have to take care and not go to the farthest extreme that is possible in increasing capacities of cars.

Heavier loading reduces the economic cost of transportation, not only by lessening the number of cars and locomotives the railroads have to provide, but in some other important ways. A main cause of the "car shortage" and slow movement of traffic in the fall and winter of 1906-07 was the congestion at large terminals. The increase, both east and west, in the minimum weights of most of the bulkier commodities is from 30,000 to 36,000 lbs., or 20 per cent. If a proportionate increase in loading could be secured, a given tonnage of the commodities affected would be moved from to or through the large terminals in 17 per cent. less cars than before; or 20 per cent. more tonnage could be moved in the same number of cars. The saving that this would render possible in expenditures for operation and terminals, as well as for equipment, would be large.

Railroads, shippers and public would benefit by the economies thus effected. In the long run freight rates would be lower than if these economies were not made. Specific rates are not based on the cost of the service; but the earnings of the railroads of the country as a whole must defray the cost of running them as a whole and leave something for interest and dividends. The fact, obvious as it may seem, that whatever reduces the cost of transportation will tend to reduce rates and that whatever increases the cost of transportation will tend to increase rates, requires to be constantly restated. By intelligently co-operating with the railroads in their efforts to keep down expenses through increases of the average car load and in all legitimate ways that do not impair the transportation service, shippers can do much more to keep down their freight bills than they can by perennially agitating against advances and in favor of reductions of rates. The railroads, on the other hand, can ameliorate the burden on small shippers in some cases by making for half carloads or three-quarter loads rates which shall be higher than the carload rate, while still enough lower than the regular L.C.L. rate to induce the best possible loading. Railroads can well afford to do this where mercantile conditions really demand it, for a 40-ton car is a highly profitable instrument, when usually loaded with 40 tons, even if occasionally it carries only 30 tons.

PUBLICITY FOR ACCIDENTS ON THE HARRIMAN LINES.

All the Harriman lines have been trying since last February, and the Union Pacific for a year before that, to stop accidents by turning upon those responsible the light of publicity and the pressure of public opinion. Prior to the introduction of the new policy, the officers of these lines had used the ordinary methods to reduce casualties to passengers and the destruction of property, but accidents continued to happen, and Mr. Kruttschnitt saw that something more must be done. It occurred to him that the great force of public opinion, usually misdirected in accident cases, might be made exceedingly useful. Now the Public Opinion policy has been given a thorough test, and the operating officers of the Harriman railroads are convinced that, as a supplement to the other methods used by the leading roads of this country to make transportation safe, it is productive of excellent results. They believe that it has promoted two most important ends: (1) It has helped to improve the discipline of employees and increase operating efficiency, thereby reducing accidents. (2) When accidents have happened it has protected the roads against newspaper misrepresentation and the unfair popular hostility that such misrepresentation engenders.

The method employed is as follows: When an accident occurs that causes large destruction of property or any loss of life the superintendent, master mechanic and engineer of the division on which it has happened go at once to the scene and organize a board of inquiry composed of themselves and of one or more citizens of the community. They then make a thorough investigation. The division engineer and master mechanic are always on the divisional boards of inquiry both because of the need for their technical knowledge and because it is desirable that they shall thresh out in the presence of their superior officer the question whether the trouble has been caused by defects in track or rolling stock. The superintendent then can act as an arbitrator and get at the truth. Mr. Kruttschnitt enforces inflexibly the rule that the cause of the accident must be ascertained. If the divisional board of inquiry reports that it cannot find the cause it is often sent back to make another investigation. If it fail again, a second board of inquiry, composed of the general superintendent, the general superintendent of motive power and the engineer of maintenance of way and one or more citizens of the community is formed and makes another investigation. If this board reports that it cannot fathom the cause it is reorganized with the general manager presiding, and still another investigation is made. In only one instance has the general manager been thus called in. In only one instance within the ten years since Mr. Kruttschnitt became Vice-President of the Southern Pacific has an accident happened in his jurisdiction the cause of which sooner or later has not been learned, and this one took place before the present method of investigation was adopted.

The board of inquiry usually does its work quickly. It prepares a report of its findings, stating the nature of the accident, its results to property and persons, the cause or causes, the names of those to blame and the discipline to be inflicted. A bulletin is furnished promptly to the local newspapers, and is posted at the division headquarters of the road. (For examples of these accident bulletins see *Railroad Age Gazette*, July 10, p. 493.)

The panic last fall and the depression of business that followed reduced traffic on the Harriman lines as well as on other railroads; and accidents usually decrease faster in proportion than traffic. Nevertheless, the reduction in the number of accidents has been such as to convince the officers of all these roads that the beneficent change has been largely due to the supplementing of surprise signal tests, strict discipline and other methods conducive to safe operation with publicity. The statistics of accidents for July, 1907, and July, 1908, are believed to indicate better than any others the results that are being got, for traffic had picked up by July.

1908, on most of the Harriman lines until it was not near so far below normal as it was in the spring and earlier summer. The following table gives the number of train accidents per 1,000,000 locomotive miles during the months mentioned. The locomotive-mile was chosen as a better basis of comparison than the car-mile or the train-mile because many accidents are caused by locomotives when running light:

	Accidents per 1,000,000 locomotive miles—		
	July, 1907.	July, 1908.	Per cent. decrease.
Union Pacific	10	6.5	35.0
Oregon Short Line	26	16.5	36.5
Oregon R.R. & Navigation	7	9.0	22.0*
Southern Pacific	50	25.0	50.0

*Increase.

There was an increase in accidents on the Oregon Railroad & Navigation Company's lines, but there the accident record was already extremely good. On all the other roads there was a reduction. The reduction was smaller on the Union Pacific, where the system of publicity was in effect prior to July, 1907, than on the Oregon Short Line and much smaller than on the Southern Pacific. It might be added that on the Union Pacific, where the system of publicity has been in use longest, the number of persons killed in the calendar year 1907 was 105 as compared with 114 in 1906, and the number injured 1,104 as compared with 1,983 in 1906, although the number of tons of freight carried one mile on this road was 2.66 per cent. greater in 1907 than in 1906, the number of passengers carried one mile 12.78 per cent. greater, the train mileage 10.16 per cent. greater and the car mileage 5.71 per cent. greater (*The Railway Age*, Jan. 10, 1908, p. 53.)

But it is not the results that already show in statistics that have the greatest significance, but rather the influence which is being exerted upon railroad officers and employees and upon press and public, and which it is believed will lead to most important results in future. Operators, trainmen, trackmen and other employees know now that any failure to perform their duty that leads to an accident will be made known to all the people of the community in which they live. Many men who can bear the censures of their superiors cannot stand the thought of having the results of their careless or reckless disobedience of rules published in their local newspapers and read and discussed by their families, fellow employees and neighbors. Publicity stimulates in the same way, and also in a different way, the entire operating staff from petty officers to general managers, to whom the condemnation of their fellow citizens is just as distasteful as it is to their subordinates. It sometimes has been asked what good it can do to have merchants, farmers, druggists or newspaper men on boards of inquiry to investigate railroad accidents. The experience of the Harriman lines has shown that it may do a great deal of good. A newspaper man or banker will not learn much by looking at a broken rail or a bad sheet in a boiler that has exploded; but he can see and tell his neighbors whether the railroad experts make a thorough or a "whitewashing" investigation, and his presence stimulates the railroad experts to do their work conscientiously and thoroughly. The stimulating effect of publicity for accidents has been felt by employees and officers throughout the operating departments of the Harriman system, up to and including the director of maintenance and operation. The consciousness that if there was a bad accident or a series of bad accidents on the Harriman lines the publicity that he was responsible for might prove a club for public sentiment, has been found by Mr. Kruttschnitt to be a constant incentive to exertion to make the operation of these railroads safer for both employees and public.

The policy of using the consolidated brains of all operating officers of both the Union Pacific and the Southern Pacific systems to make the transportation service safer and more efficient was adopted about three years ago, soon after Mr. Kruttschnitt's jurisdiction was extended over both systems. When the proposition to adopt publicity as a remedy for accidents was first made by Mr. Kruttschnitt, it was looked upon as too much of an innovation by the officers of all the roads except the Union Pacific, who showed a willingness to give it a fair trial. The results on the Union Pacific were so satisfactory that the officers of the other roads indicated at the end of a year that they would like to have it extended to their lines; and now the officers of all the roads in the Union Pacific and Southern Pacific systems are in hearty sympathy with the scheme.

One of the most gratifying facts is the change that has taken place in the attitude of the newspapers along the lines. The accident record of American railroads is bad enough without being exaggerated and misrepresented. Nevertheless, it has been for years a subject of constant newspaper exaggeration and misrepresentation. Newspaper men have said—and there is much justice in their contention—that the railroads have invited the bad treatment that they have received. Railroad operating officers, acting under orders from headquarters, often have suppressed news about accidents. When the press has found out that an accident has happened railroad officers have refused to give details. The reporters have had orders from their superiors to get a "story." Being denied the facts, and being exasperated by the attitude of railroad officers, they have dished up in their papers rumors or fakes, the publication of which hurt the roads a great deal more than the facts would have hurt them. The course of railroad officers has been wrong in principle and often exceedingly stupid in practice; for the public has a right to know the facts about railroad accidents, and railroad officers ought to have learned long ago that if the newspapers cannot get the facts they will print what they can get, being careful not to make the "stories" less sensational than the facts as finally ascertained shall show that they were warranted in doing.

Since the Harriman lines began to give to the newspapers the facts about accidents just as soon as they have been learned the number of sensational and harmful "stories" printed about them has grown gratifyingly less. The newspapers have not always used the somewhat prosaic bulletins sent them; but being supplied promptly with correct information they have been deprived of disposition and pretext to print anything else. The worst recent wreck on the Harriman lines was that on the Southern Pacific at Oakland, Cal., on July 14 last, when the engineer of a passenger train in broad daylight ran past a signal that was plainly set against him, and his train, in consequence, was cut in two by a train on a crossing track, and seven people were killed and 19 injured. A board of inquiry composed of 11 railroad officers and four citizens was formed, and the facts were speedily ascertained and given to the press. It being shown that the railroad management had done all it could to prevent just such catastrophes, press and public promptly and frankly vindicated it from responsibility, and fixed the entire blame upon the luckless or reckless engineman. Formerly, the railroad management probably would have been ignorantly and savagely criticised.

Public opinion has been influenced favorably to the railroads by the changed attitude of the press. It has been similarly influenced by the presence on the boards of inquiry of citizens. The boards have included men from almost every walk of life. One board, for example, was composed of the division officers of the railroad and two farmers. Another was composed of the division officers, a hotel proprietor and a civil engineer. Another included two merchants and the agent of an express company. There has been no trouble about getting citizens to serve. These men tell their neighbors about the way the investigations are conducted. They learn to how large an extent accidents are due to violations of rules by employees, and defend the justice of discipline, the need for which they have had brought forcibly home to them. All these influences tend to diffuse correct information, and, coupled with the candid attitude assumed by the roads, help to create a public sentiment more friendly to them.

It seems rather strange that officers of the Harriman lines have received very few inquiries from the officers of other railroads regarding the interesting experiment they have been making and its results. Probably this is because the officers of other lines are skeptical, as many Harriman officers were at first. If publicity had no good effect but to show the public just to what extent American railroad managements are responsible and to what extent they are not responsible for accidents it would be well worth widely adopting.

CHESAPEAKE & OHIO.

During a year in which the country as a whole has suffered from a great falling off of general business, the Chesapeake & Ohio has had gross earnings a little greater than in the previous year, a year of very great general prosperity. It is true that in the first half of the fiscal year ended June 30, 1908, business on the Chesapeake & Ohio was remarkably good; more traffic was offered than could be economically handled, and from this very fact it is rather surprising that the net earnings of the company for the whole year fell off but 6 per cent. This is all the more remarkable because maintenance expenses increased nearly 9 per cent. Conducting transportation and general expenses decreased 2.6 per cent., but in the previous year conducting transportation expenses were relatively high.

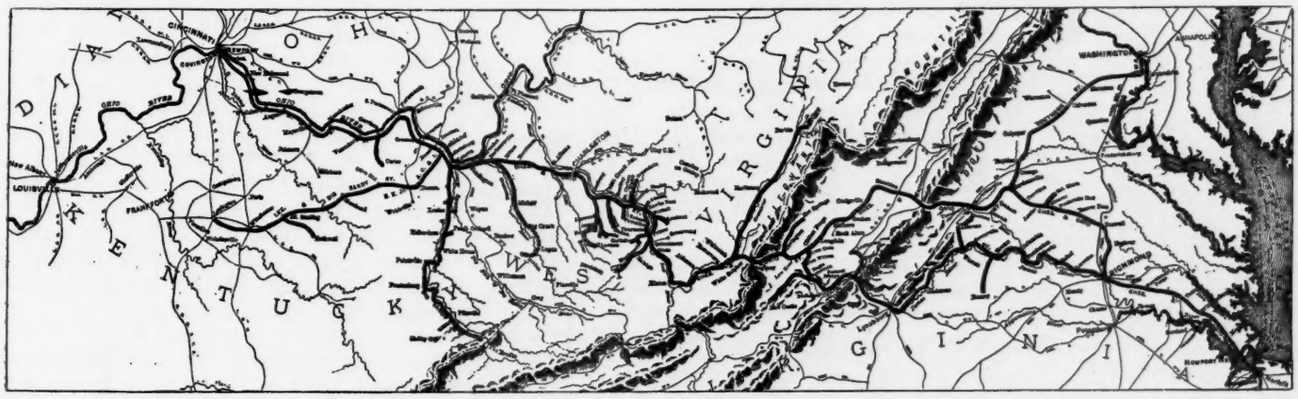
The explanation of the good showing by the Chesapeake & Ohio in gross earnings for the past year, lies in the fact that 64 per cent. of the total tonnage carried by the road last year was bituminous coal. The saving in conducting transportation is explained rather by the good physical condition of the road resulting from very liberal maintenance expenses in past years than by the character of the road's traffic.

There was issued during the year $9,750,000 general equipment and improvement 5 per cent. bonds, but, owing to the state of the bond market, this issue was deposited as collateral for short term notes aggregating $7,500,000, falling due July 1, 1910. Six per cent. series A bonds to the amount of $2,000,000 became due July 1, 1908, and were retired through the sale of an equal amount of first consolidated 5 per cent. bonds. The sale of $7,500,000 notes put the company in a strong financial position, as is shown by the balance sheet, but did not provide for future improvements on any large scale. Cash on hand amounted to $2,200,000 on June 30, 1908, an increase of $1,600,000 over the previous year, and cash deposited with trustees was $183,000, an increase of $155,000. Cost of equipment, as charged on the balance sheet, increased but $505,000, being $14,400,000 in 1908. It is plain, then, that the proceeds from the sale of the notes was spread over a number of accounts, so as generally to strengthen the asset side of the balance sheet. The Chesapeake & Ohio of Kentucky was acquired and advances previously made to it, and the cost of its stock and bonds, were transferred to cost of road.

Gross earnings for last year were $25,840,000, as compared with $25,797,000 in the previous year. Passenger earnings were $5,000,000 in 1908, an increase of 5 per cent. The number of passengers carried one mile was 286,729,837, an increase of 27 per cent. Thus revenue per passenger per mile was 1.79 cents, a decrease of 17 per cent. Freight earnings were $19,600,000 last year, as against $20,000,000 in the previous year.

As has been already pointed out, operating expenses increased during the year from $16,700,000 to $17,000,000; but conducting transportation decreased from $8,000,000 to $7,800,000. While the Norfolk & Western was decreasing its maintenance expenses, the Chesapeake & Ohio shows $1,704 spent in maintenance of way per mile of line, as against $1,691 last year. Unit costs of repairs of equipment for the last two years are as follows: $2,024 per locomotive, as against $1,973 in 1907; $852 per passenger car, as against $1,047 in 1907; $79 per freight car, as against $87 in 1907. These liberal expenditures for maintenance are probably an indication of the company's preparations to meet the competition of the Virginian Railway.

Traffic figures show that the average revenue trainload was 621 tons in 1908, an increase of 25 tons or over 4 per cent. It may be remembered that the average trainload of the Norfolk & Western increased but two tons over the previous year, totalling only 571 tons in 1908. Presumably this is revenue freight in the case of the Norfolk & Western, as it is in the case of the Chesapeake & Ohio, but no figures are given for the average trainload, including company freight, in the Norfolk & Western report. Average trainload, including company freight, on the Chesapeake & Ohio is 652 tons. While coal and coke carried was 10,900,000 tons last year, an increase of 5 per cent., other freight carried was but 5,700,000 tons, a decrease of 12 per cent., and the average revenue per ton of coal per mile was very slightly higher last year than in the previous year, while the average revenue from freight, other than coal, decreased 10 per cent. It seems rather surprising in the face of the reduction in the cost of conducting transportation that the average number of empty cars in a train was 13, an increase of 19 per cent.



Chesapeake & Ohio.

If the management of the Chesapeake & Ohio had followed the example of a great number of roads in the country and decreased its expenses for maintenance instead of increasing them, it would have been easy to show 4 or even 5 per cent. earned on the capital stock, but this has not been the policy of the company, and the regular annual dividend of one per cent. was paid on the stock. Again, if the company had some comprehensive scheme of financing its new equipment and improvements, it apparently would be easy to pay larger dividends and still keep the road up to its present high standard. Whether the sale of large blocks of stock of the Chesapeake & Ohio by the Pennsylvania and by the New York Central & Hudson River will have any effect on the future policy of the management in this regard is, of course, mere conjecture, but

if the majority of its stockholders, in contradistinction to the holders of the majority of the stock, really want a financial policy which will give them larger dividends, it would seem that now they have an opportunity to be heard.

The following table summarizes the results for the last two years.

	1908.	1907.
Mileage operated	1,840	1,827
Freight earnings	$19,571,609	$19,974,861
Passenger earnings	5,120,529	4,888,139
Gross earnings	25,843,272	25,796,861
Maint. way and structures.	3,135,354	3,090,037
Maint. of equipment	5,369,464	4,721,346
Traffic	470,957	482,444
Conducting transportation	7,770,757	7,955,064
Operating expenses	17,186,747	16,650,307
Taxes	791,061	734,423
Net earnings	7,865,464	8,412,131
Gross income	8,628,296	8,656,491
Net income	2,784,386	3,392,999
*Betterments	1,658,927	2,704,021
Dividend	627,907	627,907
Surplus	497,553	61,071

*Includes payments on account of principal of equipment trusts.

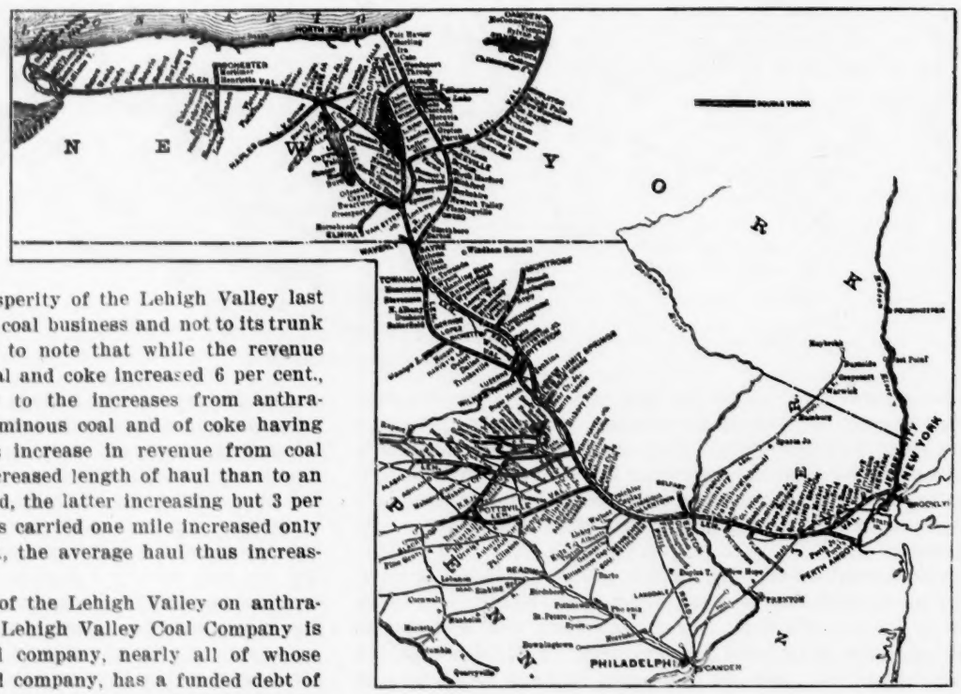
LEHIGH VALLEY.

The dual character of the Lehigh Valley—an anthracite coal carrier and a trunk line between Buffalo, N. Y., and Jersey City, N. J.—makes its showing in a year of industrial depression particularly interesting. Anthracite coal carried was 47 per cent. of the total tonnage, and freight earnings last year were 85 per cent. of gross earnings. The coal freight revenue was 46 per cent. of the total operating revenue, while merchandise freight revenue was 39 per cent. of total operating revenues, leaving but 15 per cent. of income from passenger earnings and other sources. Gross earnings for the year were $35,500,000, a falling off of less than one-tenth of 1 per cent.; but the revenue from merchandise freight decreased 6 per cent., and the revenue from passengers decreased 4 per cent. It is plain, therefore, that the prosperity of the Lehigh Valley last year was due to its anthracite coal business and not to its trunk line traffic. It is interesting to note that while the revenue from the transportation of coal and coke increased 6 per cent., the increase is due entirely to the increases from anthracite coal, the tonnage of bituminous coal and of coke having fallen off considerably. This increase in revenue from coal freight is due rather to an increased length of haul than to an increase in the tonnage carried, the latter increasing but 3 per cent., while the number of tons carried one mile increased only slightly less than 10 per cent., the average haul thus increasing by about 7 per cent.

In view of the dependence of the Lehigh Valley on anthracite coal, the position of the Lehigh Valley Coal Company is worth some study. The coal company, nearly all of whose stock is owned by the railroad company, has a funded debt of a little over $13,000,000, with fixed charges of $650,000. In addition the railroad company holds a certificate of indebtedness of the coal company for $10,500,000. The coal company and its affiliated companies mined and purchased during the year 86 per cent. of the anthracite coal carried by the railroad company, and beside the traffic thus brought to the railroad, the coal company showed net earnings of $390,000 last year. This is an increase of more than 200 per cent. over the previous year.

Of the $35,500,000 gross earnings of the Lehigh Valley last year, $16,000,000 was from coal freight, an increase of $900,000 over the previous year, and $14,000,000 from merchandise freight, a decrease of $850,000; while passenger earnings were $4,000,000 in 1908 as against $4,300,000 in the previous year. Notwithstanding the passage by the state of Pennsylvania of a two-cent fare law, which, its advocates argued, would greatly increase the number of passengers carried, the Lehigh Valley carried but 4,900,000 passengers, a decrease of about 5 per cent. from the previous year. This law has been held unconstitutional by the Supreme Court of Pennsylvania.

The road had all the traffic offered during the first half of the fiscal year ended June 30 that it could well take care of, and President E. B. Thomas points out that to show the most satisfactory earnings, the road must be a continuous four-track line from the anthracite coal regions to tidewater. The need of this is not obviously shown by the annual report, for while the ratio of operating expenses to operating revenues was 63 per cent. in 1908 and 62 per cent. in 1907, the operating ratio was 61 per cent. in September, 1907, during which month gross earnings were at their best. Moreover, there was no attempt to cut down maintenance figures, either in time of large gross earnings nor when those earnings were very much reduced. Maintenance of way per mile of road operated cost $2,414 in 1908 against $2.215 in 1907. The unit costs of repairs and renewals of equipment for 1908 were as follows: Per locomotive, $2,655; per passenger car, $568; per freight train car, $51. It is not of much value for comparative purposes to give the figures for the previous year, since the method of accounting prescribed by the Interstate Commerce Commission makes direct comparison impossible, still it is of interest to note how liberal have been the expenditures for maintenance of equipment in the past. In 1907 the unit costs were: Per locomotive, $3,266; per passenger car, $714; per freight car, $62. The equipment of the company was increased during 1908 by 28 locomotives, there being 885 in service June 30; by 22 passenger train cars, making a total of 537 in 1908, and by 991 freight train cars, making the total ton capacity of freight cars 1,504,640 in 1908.



Lehigh Valley.

The train and car statistics for last year do not show any marked changes from the previous year, except in the per cent. of empty freight cars per freight train. The average number in a train being 12 in 1908, as compared with 11 in 1907, an increase of about 10 per cent., and at the same time the average number of loaded freight cars in a train decreased from 24 to less than 23, about 6 per cent. The average train-

load of revenue freight was 530 tons last year, an increase of four tons over the previous year.

While the taxes of a majority of the roads whose annual reports have so far been reviewed in the *Railroad Age Gazette* decreased during 1908, the taxes of the Lehigh Valley amounted to $1,000,000 last year, an increase of 27 per cent., and it is pointed out in the annual report that while many appeals have been taken from assessments that seemed unreasonable, these appeals have met with but little success.

The balance sheet shows that the value of equipment charged to capital account has increased during the year by a little over $4,000,000, and equipment trust obligations have decreased by a little less than that sum. One million dollars general consolidated mortgage bonds were sold, leaving $6,000,000 of these bonds in the treasury. Cash on hand along with current assets, remains nearly exactly the same as in the previous year, while current liabilities have decreased from $5,400,000 to $3,500,000. The regular dividend of 4 per cent. and the extra dividend of 2 per cent. was paid on the common stock, leaving a surplus only very slightly smaller than in 1907.

The character of freight carried was, in general, the same as in the previous year, the tonnage of most commodities having decreased, with the exception of anthracite coal, as previously mentioned, and of grain. It has been pointed out before in the reviews of the annual reports of other roads that grain is one of the very few commodities the tonnage of which has not decreased during an unprosperous year. The Lehigh Valley carried 7 per cent. more grain in 1908 than in 1907, making the total tonnage in 1908 1,200,000 tons. In sharp contrast to the increase in anthracite coal, the tonnage of ores fell off 34 per cent., being but 480,000 tons last year. The depression in the building trades is shown by a decrease of 18 per cent. in the tonnage of cement, brick and lime carried, the total tonnage being 1,800,000 tons last year.

The recent decision of the United States Circuit Court, holding the Commodity Clause of the Act to Regulate Commerce unconstitutional, makes the position of the Lehigh Valley a very strong one. With its control of the anthracite coal mines assured, and with a very ample working capital—not to mention the $6,000,000 bonds held in the treasury—the present dividends on the common stock have a broad margin of earnings between them and any necessary reduction.

The following table, rearranged according to our usual method, shows the results for the last two years:

	1908.	1907.
Mileage operated	1,448	1,443
Freight earnings	30,186,581	30,134,476
Passenger earnings	4,150,890	4,326,119
Gross earnings	35,510,154	35,521,447
Maint. way and structures.	3,496,139	3,344,182
Maintenance of equipment.	5,987,411	6,186,874
Traffic	778,653	771,146
Transportation	11,367,496	11,149,201
Total operating expenses.	22,203,705	21,967,331
Taxes	1,122,867	885,909
Net earnings	12,183,582	12,668,207
Gross income	13,704,600	14,283,198
Net income from Lehigh Valley Coal	388,606	111,250
Net income	7,759,180	8,204,795
Betterments	1,775,264	2,068,591
Dividends	2,430,718	2,144,044
Surplus	3,553,198	3,992,160

NEW PUBLICATIONS.

The Principles of Mechanics. By Henry Crew, Ph.D., Professor of Physics in Northwestern University. New York: Longmans, Green & Co. 295 pages; 5 in. x 8 in.; 110 illustrations; cloth.

A title that would convey a clearer idea of the character of this book would be the Mathematical Principles of Mechanics; and, it might be added, in terms of the higher mathematics; for the reader or student or whomsoever he may be who undertakes to read it must first be versed in all of the intricacies and niceties of the calculus, else it will be utterly unintelligible. The book represents a lecture course which has been given to second-year students at the Northwestern University, and "the prerequisites have been a course in general physics and a course, either concurrent or antecedent, in the calculus."

It seems well that this has been put in printed form, for it is difficult to see how a student, unless he were possessed of remarkable mathematical ability, could follow the reasonings and demonstrations with the rapidity with which they must necessarily have been presented in a lecture.

A thorough grounding in the principles of physics is necessary also, and with this mental training, and familiarity with the subject, the student will be in a position, if he is a worker, to appreciate, go through and possibly enjoy the mathematical gymnastics involved.

But, given this preliminary training, the course is clear, logical and definite, and possesses the decided advantage of being demonstrative. Everything is proved and the student is not asked to accept mere statements of fact. Of course the book deals solely with abstract conditions, and starts with the position of a particle in space and the method of locating it with rectangular coordinates; then of its change of position and its translation by linear and angular displacements. Motion, velocity and acceleration, with the relative variations are treated consecutively and systematically. Inertia, stress, force, power, energy are all defined and their influence calculated; but all in that abstract way, which if applied to the problems of everyday engineering and a dependence placed upon the results, would lead to no end of disasters, because of the failure to consider coexistent conditions that modify the ideal. It follows therefore that very little practical use in everyday computations would be made of the methods set forth in this book; for, in the case of very many of the examples that are given there are shorter and simpler methods of calculation that would give equally accurate results. That does not detract, however, from the value of this mathematical analysis, which, when mastered, will give the student a comprehension of the subject that will enable him to see the conditions in his imagination in a way that would be difficult without it.

All through there are clear-cut statements of principles of action that are interesting as a summary of results, followed by a mathematical discussion of the principles involved. These become more frequent as the work progresses and the demonstrations are more easily followed. For example there are discussions of stress and strain, of the distinction between solids and fluids, between gases and liquids and a soft solid and a viscous fluid, with all the other physical characteristics of matter; closing with a brief chapter on hydrodynamics.

Conversations on Electricity. By Joseph G. Branch. Chicago: Rand, McNally & Co. 282 pages; 5 in. x 7½ in.; 96 illustrations. Cloth. Price. $2.00.

This book is in the form of a catechism, and the general impression that it makes is that it was made on demand, not written because it was needed or because the writer had a special message to deliver. It contains much useful information, but it may be doubted whether a person totally ignorant of all electric and magnetic phenomena could read or study it and get a clear idea of what is treated, though the book purports to be "an elementary work, written expressly for engineers and students," presumably limiting the word "engineer" to the man in charge of the engine driving the electrical machinery. In his preface the author says that "electricity is still a mystery to all," and that it "is not a solid or liquid or a gas," and yet he states positively that it is a "substance." This appears to indicate at least a confusion of ideas and leads to the suspicion that the book is the result of more or less cramming and not the outpouring of a mind saturated with the subject.

The rather futile attempt is made to explain by definition—than which nothing is more difficult with so subtle a thing as electricity. There has never yet been a definition of life, for example, that would convey an idea of what life really is; and so with electricity, definitions fall far short of being explanations. Their only advantage lies in their brevity,

which enables an author to cover a great deal of territory within the limits of a comparatively small number of pages.

It must not be understood that the book is merely a series of definitions for there are explanations and attempted explanations throughout. It is unfortunate that more care has not been taken with this part of the work, for some of these explanations are anything but lucid. Take, for example, that of the Wheatstone bridge. It is doubtful if anyone not thoroughly skilled in the construction and operation of that piece of apparatus would be able to understand it from the explanation given! So, in the outline of Faraday's experiments on induction, there is a bare statement of what Faraday did, but not always a clear statement of the logic of the several events.

Of course such a book as this has its value, but it should always be remembered that elementary instruction, to be effective, should start with a thorough grounding in principles and not on a bare statement of facts.

The scope of the book is very wide. From the table of contents it will be observed that it starts with the nature of electricity and works on through its various manifestations, the methods of its development and measurement, with outlines of the construction of the dynamo and its several parts, to the transformer, and the torque and power delivered. A wide range; in some instances with a clear handling of the matter in hand, but designed as a whole rather to throw the man who attempts to enter the door of electrical information under a cloud of discouragement than to illuminate his path. The complications of electrical machinery are confusing at the best, and an understanding of them can only be obtained by a thorough grounding in the principles upon which they are constructed, a grounding which a work of this limited size cannot give.

Letters to the Editor.

RESPONSIBILITY FOR CAR WHEEL PRACTICE.

New York, September 24, 1908.

To the Editor of the Railroad Age Gazette:

The communication from H. G. I. in last week's paper is a good illustration of the attitude of some of those who are responsible for present conditions in the manufacture and use of chilled car wheels. It is generally admitted that these conditions are growing more dangerous from day to day and there seems to be a general idea that the difficulties can be remedied by the adoption of specifications covering details of foundry practice in the manufacture of such wheels.

The vogue of theory has had a long trial in the case of the chilled wheel, and has brought to the front men that may have a good theoretical knowledge of what they have in hand, but that have seldom if ever done any actual work upon the details of manufacture and practice under their charge and control.

No doubt many leading railroad officers have been so much occupied that such matters have been left to subordinates, whose reports and opinions often compiled from other reports and opinions, have constituted the grounds on which the general practice has been carried forward. If some of the higher officials would call for and personally attend a few demonstrations of the theories upon which present practice is based, there might be some interesting results.

No doubt H. G. I. intends to help matters by "speaking plainly," and it would seem that he speaks from the standpoint of a wheel inspector or a wheel buyer. His statements would give the impression in many ways that a considerable part of the business of making chilled wheels had reached the point where deceit in the matter of making the inspections, ignorance in the matter of making the mixtures, operating cupolas for melting iron, and generally carrying on foundry details—had come to be general practice.

I will not say that such things do not exist, but I will say that they are principally due, and have arisen out of the conditions that the railroads have allowed to grow up in late years. The lowest bidders have been allowed to secure orders regardless of whether price paid would cover the cost of good or even safe shop practice, and material. So many railroads and wheel makers have followed this line of practice that it has been necessarily imposed upon other wheel makers and railroads whether they were willing to approve it or not. The exchange of cars and the purchase of wheels for repairs on same, and the indiscriminate delivery of old wheels in part payment for new ones has spread the result of the practice everywhere.

It necessarily followed that to supply the demand for cheap wheels, the manufacture of same increased, and that the use of great numbers of such wheels has come to prevail.

Given a wheel maker with an order for which he is to get less than one-half cent per pound, cash payment, together with a scrap car wheel delivered free, to complete the full payment, and is thus placed under the necessity of doing his business, providing material and labor for the operation, providing for the costs of expensive tests, guarantee, etc., out of what he receives, it is not difficult to see what can generally be expected. He will remelt the scrap wheels to make new ones, and will do the best he can to complete the operation without loss, and in the best manner that he can.

It requires upward of 3,000 tons of new chilled car wheels daily to maintain renewals and repairs on American railroads, the principal part of the metal for which, is obtained by recasting old wheels into new ones. Considering the class of material that has been too often and too largely used for the balance of the operation, it is small wonder that the conditions are what they are. That result was inevitable.

H. G. I. speaks of the principal matters to regulate by inspection: "Charging of metals," "melting of iron," and four or five other details of lesser importance. Just why he has left out many others is a question, as the list could be increased many times and yet not include all the important and necessary ones. Railroads compel wheel makers to give more attention to making wheels that will pass the tests than to making wheels that will give good service. To remedy a mistake of this kind by adding to it still further would be unwise. Railroad officers who believe the best way to get good wheels is to impose elaborate and detailed specifications, might take over one or two car wheel works and give a demonstration of their ability to produce the results they claim can be obtained, before wheel makers are asked to change or virtually abandon their practice, and yet remain responsible for results.

H. G. I. speaks of "rotten" wheels that can be made from 40 per cent. charcoal iron mixtures. It may be said that the same class of conclusions can be arrived at by a wrong comprehension of the facts. No well informed wheel maker would contend that the use of good material without good shop practice was sufficient, and this remark, like some others in the communication referred to, is calculated to do more harm than good. So long as a sufficient proportion of the railroad officials, having this matter in charge, remain wedded to the idea of paying less than $1.00 per annum, as the net first cost for a new car wheel on the basis of a four-year guarantee, just so long are present conditions likely to continue.

The average price paid for chilled car wheels for the heaviest service does not exceed $4.00 in cash, with the delivery of an equal weight of scrap wheels, free of charge. No matter what the price paid may appear to be by figures that represent the price of new and old wheels, as higher or lower, this is the actual result that obtains to-day, and has obtained for years, in the matter of prices paid for such wheels. As all guarantees are for at least four years, this represents, as stated, an annual cost of $1.00 per wheel. If this price was raised to the extent of 50 cents per annum, or $2.00 per wheel, it would enable the use of first-class mixtures and good shop practice.

Until the railroads realize this fact, and meet that vital part of the situation, there is little probability that much improvement can be expected. P. H. GRIFFIN.

SIDE BEARINGS AND CENTER PLATES.

Chicago, September 17, 1908.

To the Editor of the Railroad Age Gazette:

In the Sept. 11 issue of the *Railroad Age Gazette* appears a clear and brief discussion of Mr. Stucki upon the question of antifriction supporting means for car bodies, viz.: side bearings and center plates. The article suggests that on account of the long lever arm through which the side bearing acts, that this member is, from the standpoint of reducing friction, far more important than the center plate. Like many questions of a similar nature, the one under consideration is perhaps not susceptible of a categorical answer. It is, however, certain that the work done to move either center or side bearing is the product of weight, coefficient of friction and distance.

Under present conditions of car construction most of the weight is carried upon the center plates where the movement is slight, while the side bearing intermittently supports a comparatively small portion of the load, even on average curves, but the movement is relatively large. The relation between these movements is roughly as 4 is to 30. Thus it would appear that the center plate friction is theoretically the more important until a point is reached where the center plate carries but 7½ times as much weight as the side bearing. For a loaded 50-ton car this would mean about 58,000 lbs. and 7,000 lbs. respectively.

This discussion takes no account of important service conditions, such as the relief afforded by anti-friction side bearings as regards derailment on curves, or of their value in the case of unevenly loaded equipment and other cases where the combination of friction and long lever arm may be a great disadvantage.

It appears to be the opinion of many investigators that a free, easy turning movement, between truck and car body, is desirable at all times, that is, whether on tangent or curved track. If this is a fact, as seems reasonable, the center plate question is deserving of careful study.

It seems, in general, that the desirability of anti-friction center and side bearings for cars stands upon the same broad foundation. While it is true that the principle of the latter only has been approved by the committee, it seems but reasonable to expect a similar action on the center plate when it shall have been brought into more general use and attained higher perfection. EDWIN S. WOODS.

[In the article on Anti-Friction Side Bearings, printed in the *Railroad Age Gazette*, Sept. 11, page 920, paragraph f, at the bottom of the page, last line, should read: "Regardless of the curvature of the track." The drawing, Fig. 6, was intended to be shown with the concave bearing surface above the roller, with the roller resting on a plane surface.—Editor.]

THE PRODUCER GAS POWER PLANT OF THE MINNEAPOLIS & ST. LOUIS.

Chicago, September 21, 1908.

To the Editor of the Railroad Age Gazette:

Referring to the article in your issue of September 18 on the producer gas power plant of the Minneapolis & St. Louis Railway at Minneapolis, Minn., and to the figures per brake horsepower hour given, the undersigned begs to call your attention to the steam power plant of the Dale street shops of the Great Northern Railway at St. Paul, running since 1901. The actual cost of coal at $3 per ton is 0.348 cents per brake horsepower hour. Using Illinois slack coal the cost per brake horsepower hour for coal alone is 0.303 cents. With the installation of superheaters this cost will be reduced to 0.25 cents per brake horsepower hour. Labor in this plant was reduced to about one-third of that in the old steam power plant which it displaced. On account of perfect combustion there is no smoke nuisance.

The first cost of a gas producer plant is approximately two and one-half times that of a steam power plant.

MAX TOLTZ.

REGULATING RAILROAD TRAFFIC.*

BY E. E. CLARK,
Of the Interstate Commerce Commission.

Fixing the conditions under which, and the rates at which, the enormous traffic of this country shall be transported is a huge undertaking. No citizen is so lowly or so obscure that he is not interested in and affected by the conditions under which our railroads are operated. Fortunes are made or lost by large manufacturers or dealers, dependent upon efficient or inefficient service on the part of some carrier. Localities prosper or languish, as they are well or poorly provided with transportation facilities. Large centers of population would be in desperate straits for food and other necessities of life if the transportation lines serving them were inoperative for a few days. Our people, from the millionaire to the tramp, travel more and more frequently than in any other country or in any other age.

It is not, however, an impossible or a hopeless task to so state the terms under which persons and property will be transported as to remove all reasonable doubt as to what those terms are, and to insure equal treatment for all who, under similar and substantially like circumstances and conditions, employ the transportation facilities. Much has been accomplished in the direction of such clear and definite statement of rates and conditions. Much still remains to be done, and in that work your cordial co-operation is needed and desired. The conditions aimed at will, when reached, remove by far the greater number of complaints from individual shippers. Contests between rival commercial centers and localities we will always have; but we should not have controversies as to what tariff contains the lawful rate or what that tariff provides or means.

I realize how naturally the complications of the recent past and of the present grew up under the old conditions. I do not underestimate the volume of careful work that must be done before the condition of tariffs which we expect to have is had. I realize that it will cost some money. But when we have reached that condition we will but have established a condition that should have obtained from the first, and one that the carriers will not willingly depart from. The expense will all be returned in economies which the improvement will bring and the value of the removal of friction between carriers and patrons that will thus be effected cannot be estimated in dollars.

Errors of carriers' agents by quoting rates to prospective shippers is a serious cause for complaint. Commercial transactions of great importance and involving large sums of money are consummated on very short notice. A manufacturer or a dealer is asked for a price on certain goods delivered at a certain point. He asks the agent of the carrier what the transportation rate will be, and, on the strength of the quotation given, makes the sale. It is neither unnatural nor unreasonable for him to complain if in settlement his consignee deducts from the purchase price additional transportation charges which he has been obliged to pay over and above those named by the carrier's agent, and frequently above the rate inserted in the bill of lading. Without doubt the next Congress will be urged to provide a law which will hold the carrier responsible to the shipper for the rate quoted by the carrier's agent. It seems reasonable that the shipper should have that protection, but at the same time care must be taken

*An address before the American Association of Freight Traffic Officers, at St. Louis, Mo., September 12, 1908.

to guard against the possibility of favoritism through misquotations purposely made. There must be no doubt about the misquotation having been made; the shipper should not be permitted to recover anything beyond the actual difference between the rate quoted and the lawful rate, and the carrier should be penalized by a fine so as to furnish incentive to accuracy and care.

In the past the slogan has been "Get the business" and "Meet the rate." This has led to the hauling of large volumes of traffic over unnatural and expensive routes at rates which were in no sense remunerative via that route, but which might have been fairly remunerative via a natural, a shorter and an easier route. Open and proper competition between carriers should always exist; but there is a competition which is ruinous to the carriers and not beneficial to their patrons or to the communities which they serve. The idea that all possible lines must share in the traffic between certain points, regardless of the cost of the service, is competition of that kind. The theory of universal competition of all carriers in all markets is of the unwise, if not of the ruinous sort. Is it to be wondered at if the shipper, seeing the carrier solicit business, which via its line must be hauled, say, 1,000 miles at a certain rate, wonders why the same commodity cannot be hauled to another market 500 miles distant at a lower rate? I predict that, not as a result of legislative requirement, but as a part of more modern and scientific policies of operation, the near future will see much and careful attention given to this question of waste transportation by those who are responsible for the policies of the carriers.

The promise to "meet" any other carrier's rate has resulted in a formidable mass of claims against the carriers. Uncertain and indefinite manners of stating the carrier's charges has added another multitude of claims. Each of these causes friction and discontent; each of them costs something to handle and adjust, and when a claim is adjusted or the debt has been resolved against the claimant the patron is not the well-pleased and friendly patron he would be if he had been charged the right rate—the rate that his competitor was charged—in the first place and the transaction had there ended It is to be earnestly hoped that all carriers will fall in line with the commendable movement recently inaugurated by some and arrange that every claim originating on their own lines shall be disposed of within 30 days and those originating on foreign lines within 60 days.

In the past few years we have seen a statement in the newspapers, purporting to have come from the representatives of an important commercial organization of shippers, that the railroads have been, and are, carefully revising way-billing for the purpose of detecting undercharges, but that at the same time they were ignoring discovered overcharges in the hope that no claims for same would be made. I am not willing to even intimate that the railroads resort to downright dishonesty in dealing with their patrons. I have no doubt that the percentage and proportion of honesty of purpose and of dealing are as large and as prominent in the officers of railways as in a like number of men in commercial and manufacturing lines. I am also certain that the employees of the railroads have in them, and bring to the performance of their duties, as much of personal integrity as can be found in any like number of citizens or employees of other industries. Their record for loyalty and devotion to duty in the performance of their tasks has no equal.

Of late we have been told by men who have spent their lives in railroad building and operation that there is great need of more facilities in order to meet the demand that is sure to be put upon the railroads. A prominent and well-known manufacturer tells us that the recent panic was caused by unnecessary, uncalled-for and ill-timed extensions and developments by the railroads. The railroad managements tell us that more revenue is essential to proper maintenance and habilitation of the roads. The commercial interests strongly oppose increases in rates, and in places where such opposition is strongest the press is demanding that the railroads expend hundreds of millions of dollars for new and better passenger terminals. And there we have the whole situation as clear as day.

It seems to me that if our railroads are to be operated as private corporations, performing a public service, and subject to government regulation—and that, to my mind, is much to be preferred over government ownership—the railroads must get entirely away from favoritism and undue discrimination between patrons, and must be permitted to earn revenues from which they can and will maintain a state of physical perfection of property, furnish a liberal, efficient and high-grade service, pay good wages to their employees, and pay a reasonable and liberal return upon whatever amount of capitalization fairly represents the value of the property as a going concern. There will be difficulties and differences of opinion about determining what is the fair value of the property, but a substantially equitable method can be found. Except as they differ by agreed upon or prescribed differentials the rates between two given points must be the same by all natural transportation lines operating between them, or else we would have ruinous competition. These rates must be high enough so that the poorest of the lines can live, or else all competition would, in time, be destroyed. It is not, however, necessary that the rate be high enough to insure dividends upon over-capitalization of the poorer line, if such rates would be unreasonably remunerative to the properly capitalized and conservatively managed line.

Although strong feelings of antagonism against railroads have been manifest in some quarters, and violent and drastic methods have been proposed, advocated and resorted to, I do not believe that the people as a whole have any desire to be unfair to the railroads. Much misunderstanding and lack of understanding exists. The policy that will result in the most good now is one of perfect frankness. That will win the confidence of the people, and, coupled with strict impartiality, will create an impregnable position.

I doubt if the whole history of law-making and of effort to enforce law in this country discloses such a record of ignoring, evading and defying law as has marked the course of the Act to Regulate Commerce, commonly known as "The Interstate Commerce Law." Its purpose and its provisions have been defeated and distorted through technicalities. The effort toward government regulation of interstate carriers has been a labored and a trying one. But it must not be assumed or concluded that it has been, is, or will be a failure, or that it will be abandoned in despair. The government must be big enough and strong enough to regulate and control its own creatures and creations, or the government must be written a failure. There will be no vindictiveness, no playing to the galleries, and no partiality in administering the law as laid down by Congress; but there will be a firm purpose, an earnest effort and a fixed determination to properly administer and enforce the full intent of the law. If the law or its penalties needs strengthening, Congress may be depended upon to so provide.

New law or more law is not, however, needed nearly so much as is obedience and respect for the law which we have. This is true, not only of that law which more nearly interests us at this time, but also of all our laws. The lack of respect for law and authority which underlies the crimes, casualties and accidents of which we read in numbers daily is not a credit to our land. We now have so many laws that the most expert lawyer will hardly venture an opinion upon one of them without first consulting the statutes. Our people are not lawless by nature. They are lovers of fair play. We have, as a people, however, been so busy exploiting the resources of a wonderfully rich continent, and in making money, that we have, insensibly, fallen into a careless disrespect for the laws which we ourselves enact, and for the authority of the officers whom we elect and from whom we exact an obligation

that they will observe and enforce the law. A reawakening along this line is due.

Stability of rates is most desirable. Frequent or sudden changes should be avoided as far as is possible. Of course, if rates could be changed upon spot notice some carrier and some shipper could at some time secure an advantage. But it is practically certain that at another time another carrier and another shipper would gain a corresponding and a compensating advantage. Stability in rates is best for both commerce and carriers.

Common carriers should be permitted to form and maintain traffic associations and to issue therefrom common tariffs provided their articles of association and their rules of action are subject to approval at the hands of the proper federal tribunal and that their rules and actions are made public.

I do not think that a complaint against an increased rate should automatically suspend such rate, but I do believe that the Interstate Commerce Commission should be given authority to suspend a proposed increase in rates until such time as the reasonableness thereof can be determined, upon a complaint and a showing that warrants that action. I do not wish to be understood as wishing for or seeking more power or authority for the Commission except as it seems to be necessary in order to remove or avoid troublesome complications and uncertainties. I emphatically disclaim any criticism of the courts or of their acts. The law and the practices as at present, however, sometimes develop situations that should not be possible. The Act prohibits a carrier's engaging in transportation except under tariffs prepared, filed and posted in accord with the requirements of the Act. It prohibits a carrier's making any change in its tariff rates except on lawful notice to the Commission and the public. It prohibits a carrier charging or accepting either more or less or different compensation for any transportation service than is provided for in its tariff, lawfully filed and posted. If, therefore, a carrier has lawfully given notice of a change in rates and just before the change becomes effective a court enjoins the carrier from collecting the new rate, is not the carrier placed where it must, of necessity, violate the law or the order of the court?

No court other than the Supreme Court of the United States has a jurisdiction broad enough to include all the carriers that are parties to some tariffs. In that event all of the carriers are supposed to be bound by the terms of the law and a part of them are, by the court's order, enjoined from complying therewith. The very discriminations which the law condemns are thus created. If the Commission, which has jurisdiction over all carriers that are amenable to the law, had power to restrain a proposed increase in rates and similar power where not exercised by any other body, it would apparently simplify many situations and give to the law added force and effect.

The law imposes upon the shippers and the passenger the same obligations to observe its mandate as are placed upon the carriers, their officers and the Commission. This fact does not appear to be understood by some. It would seem to be the part of wisdom to disseminate the information among the patrons of the carriers, and it is suggested that more real headway will be made by calling attention to the mandatory provisions of the law when they fit the case than by giving the impression that it stands in the way of meeting the patron's wishes. The comptroller of an important railroad system, as a witness under oath, made the astonishing statement recently that he had never read the Act to Regulate Commerce and did not know that it prohibited the destruction of certain records.

I hope that this meeting will be profitable to you and to the companies and the industry which you represent. I hope that the country and its business interests may have the invaluable assistance which you can give it, working out the purposes of the law, which purpose no person challenges as unreasonable or unfair. We may not be able to agree with all your views. We shall continue to endeavor to administer the law in its full spirit and intent and to effect its purposes without unnecessary hardship or embarrassment to the public, to any individual or to the carriers.

JURISDICTION OF THE INTERSTATE COMMERCE COMMISSION OVER FOREIGN COMMERCE.

Franklin K. Lane, of the Interstate Commerce Commission, says in part in replying to a letter sent from the Tacoma Chamber of Commerce of Tacoma, Wash., asking for information with respect to the Commission's ruling requiring the trans-continental railroads to publish the inland proportions of their export and import rates through Pacific Coast ports:

"Such a general misunderstanding exists as to the nature of the decision in the Cosmopolitan Shipping case that it seems worth while to point out just what our ruling was. The Cosmopolitan Shipping Co. operates a line of steamships plying between Philadelphia, Pa., and different ports of northern Europe. In its complaint it alleged that the Hamburg-America Packet Co., North German Lloyd Steamship Co., the Wilson Lines and the Scandinavian-American line has organized a so-called pool whereby all traffic originating in the United States whether on the seaboard or in the interior, and destined to the north of Europe, was divided among themselves in certain designated proportions. The complainant asked that this 'Baltic pool' be declared illegal because in contravention of the anti-pooling provision of the Interstate Commerce Act.

"The Commission was thus confronted with the question of its jurisdiction over ocean steamship lines plying between the American seaboard and a foreign country non-adjacent. The Commission ruled that the jurisdictional clause of the Interstate Commerce Act gave the Commission no authority over these foreign steamship lines. The complaint was therefore dismissed.

"But this does not mean that the Commission is altogether without authority over the foreign commerce of the United States. The Interstate Commerce Act is by its terms applicable to the transportation of 'property shipped from any place in the United States to a foreign country and carried from such place to a port of transshipment, or shipped from a foreign country to any place in the United States and carried to such place from a port of entry either in the United States or an adjacent foreign country.' It thus appears that the Commission has ample jurisdiction over the foreign commerce of the United States while moving between the seaboard and interior points. It logically and necessarily follows that the rate for the inland movement to or from the seaboard must be filed and published in order to comply with the express provisions of the law. If joint rates only were required to be published, the proportion of each carrier being unknown, the law could easily be set at naught through collusion between the railroads and ocean carriers. Rebates and preferences could be granted at will. No punishment could be imposed for making a concession from a joint rate of this character, as it would be impossible to connect the offense with the carrier over which alone the Commission has control.

"The railroads have not gone into court to have the Commission enjoined, because they know its position is legally unassailable. The whole difficulty arises from their reluctance to make public the inland proportions of these joint rates. Their earnings on this traffic are so small that they fear the dissatisfaction of domestic shippers and the complaints that would follow. The Commission is urged to reverse its ruling upon the ground that it is doing serious injury to the Pacific trade. If this were so, it would not reflect upon the Commission's ruling, but would argue against the advisability of the law which the Commission is charged to enforce. However, there is good authority for the position that the ruling in question is not the cause of the depression in the Pacific trade. Messrs. Hill and Harriman are somewhat widely known as

well-informed railroad men. Neither is suspected of undue regard for the Interstate Commerce Commission. Yet when interviewed with respect to the unsatisfactory condition of the Pacific trade, it does not occur to them to place the responsibility with the Interstate Commerce Commission. Mr. Harriman says, 'There is just as much of that business as ever before. The only difference is there is more competition on the water.' To Mr. Hill the question apparently was a very belated one. 'Why, our Pacific trade has been gone for a year. As long as 15 months ago I told them what was coming.'

"Asked if the action of the American trans-continental roads in withdrawing from the Pacific carrying trade was due to resentment at the action of the Interstate Commerce Commission, Mr. Hill replied: 'Resentment? No. The Commission can not be blamed for enforcing the law. The Pacific trade was given up because it did not pay.'

"Here we have the frank admission that the unsatisfactory condition of the Pacific trade is due entirely to the operation of natural causes,—in no respect to the action of the Interstate Commerce Commission.

"For some time the Pacific trade has been in difficulty. Ever-increasing competition on the part of the Japanese steamship lines, heavily subsidized and economically operated, has crowded our American vessels hard. It is a matter of general knowledge on the Pacific Coast that when the immigration of Chinese coolies was ended some years ago the then existing steamship lines out of Pacific ports to China openly declared that they would be compelled to withdraw from all Oriental trade, as their chief source of revenue came from this class of immigrant travel. They found before long, however, that Japanese coolies could be substituted for Chinese, and I was told by the manager of one of these lines over a year ago that if the immigration of Japanese was checked by the action of our Government, it would lead to the withdrawal of the most important of the Pacific lines from Japanese-Chinese business, unless a Government subsidy were granted as an offset. So that whatever the distress of the American steamship lines on the Pacific their embarrassment was long since charged to other causes than the Act to regulate commerce or any decision of this Commission. Such discretionary power as is vested in us has already been exercised in favor of the Pacific steamship lines, the Commission now permitting a reduction of Pacific Coast import and export rail rates upon three days' notice and an increase upon 10 days' notice. This action was taken with the express purpose of meeting the requirements of the Pacific trade."

ANNUAL REPORTS TO INTERSTATE COMMERCE COMMISSION.

The blank form on which railroads will be required to make their annual reports to the Interstate Commerce Commission for the year ending June 30, 1908, has been prepared and printed and will soon be mailed by the Commission to the railroads. The data gathered by means of these blanks is the basis for the Commission's annual volume of "Statistics of the Railways of the United States."

The form is very different in many respects from the forms sent out in previous years. Many of the changes have been made to conform the reports to the new system of accounting prescribed by the Commission. There are 127 pages as compared with 80 pages for previous blanks, and when the questions are answered, the Commission and the public will have access to much more detailed information regarding railroad affairs than ever before.

In a note on the inside cover page, the Commission states that five forms of annual reports will be required. Annual Report Form A will be required of "large roads." By this is meant roads operating a mileage of more than 250 miles or having annual operating revenues of more than $1,000,000. Form B is for roads having less mileage and smaller operating revenue. Form C is for switching and terminal companies. Form D is for the return of the revenues and expenses of outside operations by such companies as incidentally conduct them in connection with their rail operations. Form E is provided for "lesser companies," these being companies which mantain an independent existence and keep financial but not operating accounts.

The Commission for the first time requests each company to send to the Division of Statistics and Accounts two copies of its latest printed annual report to stockholders.

Detailed information is required relating to where the control of the various railroads lies. On pages 8-11 of annual report Form A—"Large Roads"—each railroad is required to state what active or inactive corporations engaged in transportation are controlled either solely or jointly by it, control being defined as "ability to determine the action of a corporation." Other information required relates to how control was established, the extent of it, whether direct or indirect, if indirect the name of the intermediary through which control is established, and other parties to the agreement for joint control. In the column headed "Extent" must be shown the extent of the interest of the respondent corporation in the controlled corporation. When indirect control is exercised through an intermediary holding company, trustee or any other corporation or individual not making an annual report to the Commission, the controlled corporation must be entered with the name of the intermediary. If the intermediary is an operating company which makes an anuual report to the Commission, the indirect control need not be shown.

On pages 16 and 17 statements are required of "Outside Operations" and "Other Properties." Under the head of "Outside Operations" the character of the business, the title to it and the state or territory in which it is conducted must be shown. The same data must be given regarding "Other Properties," which are defined as "All government land grants, coal, lumber and other business properties not included in the railroad line owned, or any outside operations, the revenues and expenses of which affect the general balance sheet." Revenues, expenses and taxes of these properties are required to be summarized on page 67.

On pages 32-37 the Commission asks for detailed information regarding "Additions and Betterments Expenditures" and "Expenditures for Road." With reference to the information to be given under the former head, the Commission refers to Accounting Series Circular No. 11, under date of July 5, 1907, in which it offered a tentative classification of additions and betterments expenditures and says that if accounts have been kept in accordance with this classification the amounts should be entered in the appropriate columns which, under the head "Expenditures During the Year," include "Charged to Capital," "Charged to Special Funds" and "Charged to Income." In any case it is expected that expenditures for additions and betterments will be totalized on page 33 and analyzed on pages 35 and 37, in accordance with the list of accounts under "Expenditures for Road and Expenditures for Equipment." The heads of the blanks for "Expenditures for Road" and for "Expenditures for Equipment, General Expenditures and Recapitulation" are as follows:

Expenditures for Road.

Expenditures for new lines or extensions during the year.		Expenditures for additions and betterments during year.		Total cost to June 30, 1907.	Total cost to June 30, 1908.
Charged to capital.	Charged to special funds or income.	Charged to capital.	Charged to special funds or income.		

The blanks for reports of operating revenues have been changed to conform to the new accounting system. On pages 49-51 the roads are required to report all the railroad stocks owned by them in both active and inactive corporations and

whether they are free assets or are pledged for the issue of other securities, but the two classes must be entered separately as "unpledged" or "pledged." For the dividend-paying stocks owned the amounts of dividends declared during the year must be shown, except that no income should be shown for the stock of the respondent corporation. If stocks of other concerns have been sold during the year covered by the report dividends accruing on them during the time they are held and the rate of accrual should be given. Par value of stocks still owned must be given. Par value of stocks no longer owned need not be given. Under the head "Valuation," the value at which the stocks specified are carried into the general balance sheet must be given.

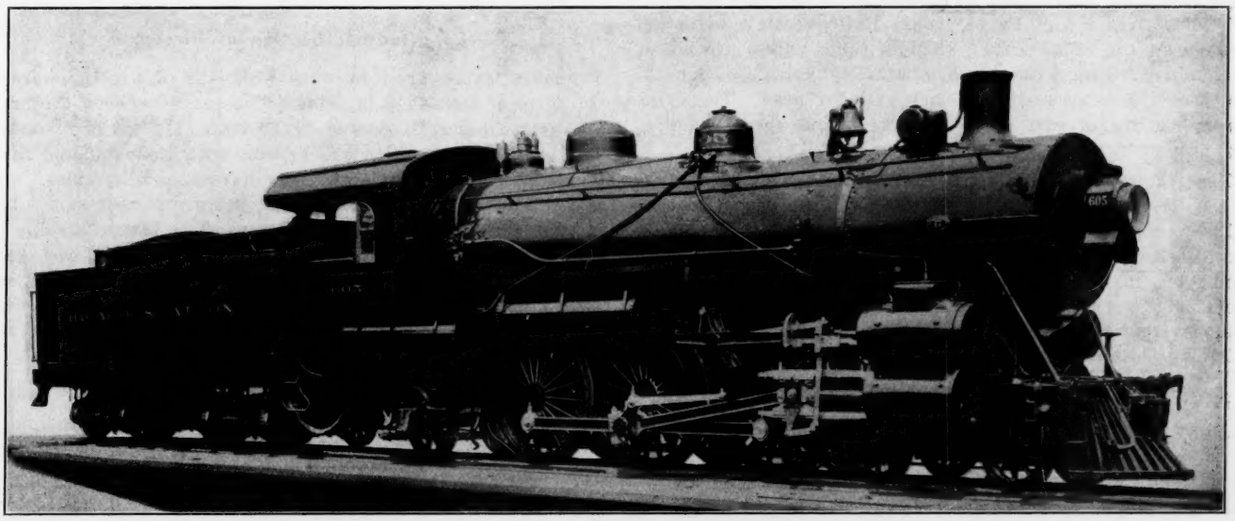
The blanks relating to operating expenses and the hire of equipment have been changed to conform to the new accounting system. Under "Traffic and Mileage Statistics," pages 92-95, more complete information is required than formerly. Locomotive mileage, for example, is now asked for. Under the head of "Consumption of Fuel by Locomotives," pages 112 and 113, the Commission for the first time gives instructions for equating the use of oil as fuel as follows: "If oil is used as fuel, its equivalent in tons of coal should be included in their total fuel consumed—tons—the reduction being made upon such a basis as the experience of the company making the report has shown to be proper; but a statement should be made under explanatory marks below showing this basis." One seeming omission from the blank for "Description of Equipment" is the superheater locomotive. Although 500 or 600 are in use in America, of which about 80 per cent. are owned by the Canadian Pacific, no blank for describing them is given.

The Commission has prepared a new form of "Summary of Monthly Reports of Revenues and Expenses." This new form will be used in the Commission's offices for compilation of reports of revenues and expenses monthly, quarterly and yearly for all railroads, and it is stated that hereafter the Commission will issue quarterly summaries of revenues and expenses of the railroads of the country similar to its quarterly accident bulletins.

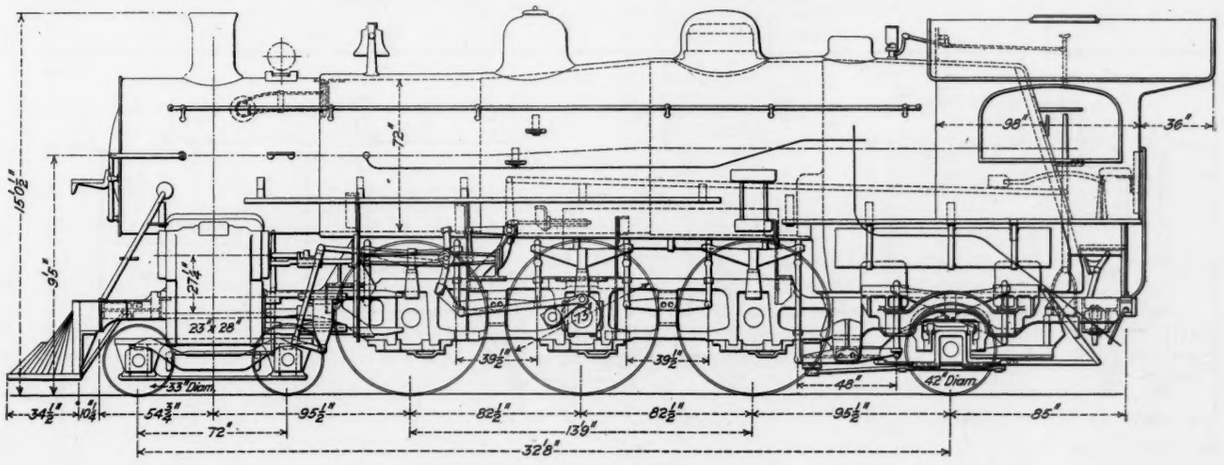
PACIFIC LOCOMOTIVES FOR THE CHICAGO & ALTON.

The first standard gage Pacific locomotives built by the Baldwin Locomotive Works were completed early in 1903 for the Chicago & Alton Railroad. These engines were two in number, having driving-wheels respectively 73 in. and 80 in. in diameter. Otherwise they were similar throughout, with cylinders 22 in. x 28 in. In the following year three additional Pacific locomotives were supplied to this road by the same builders. These engines, although built (with the exception of the tenders) to Associated Lines standards, were in many respects similar to those delivered in 1903. They had driving-wheels 77 in. in diameter, and the same size of cylinders as the previous locomotives.

The Baldwin Locomotive Works have recently completed five additional Pacific locomotives for the Chicago & Alton,



Pacific Locomotive; Chicago & Alton.

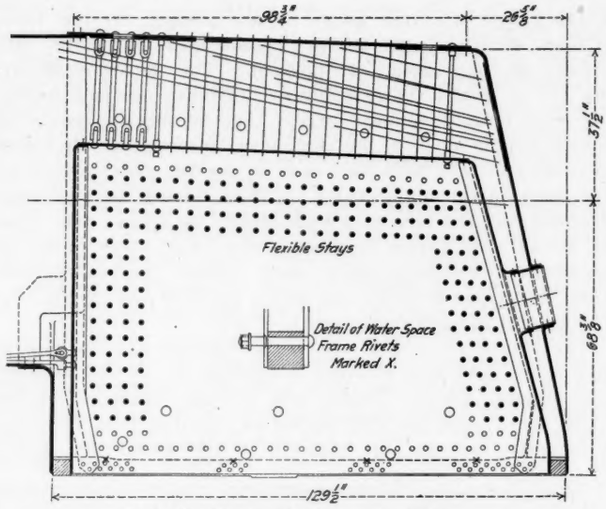


Pacific Locomotive; Chicago & Alton.

the design being illustrated by the accompanying reproduction of a photograph and drawings. The principal differences between these locomotives and those above mentioned, lie in the use, on the new engines of Walschaerts valve gears and wagon top boilers with narrow fireboxes. This form of firebox was applied to a number of Atlantic type locomotives built for the same road by the Baldwin Locomotive Works in 1906.

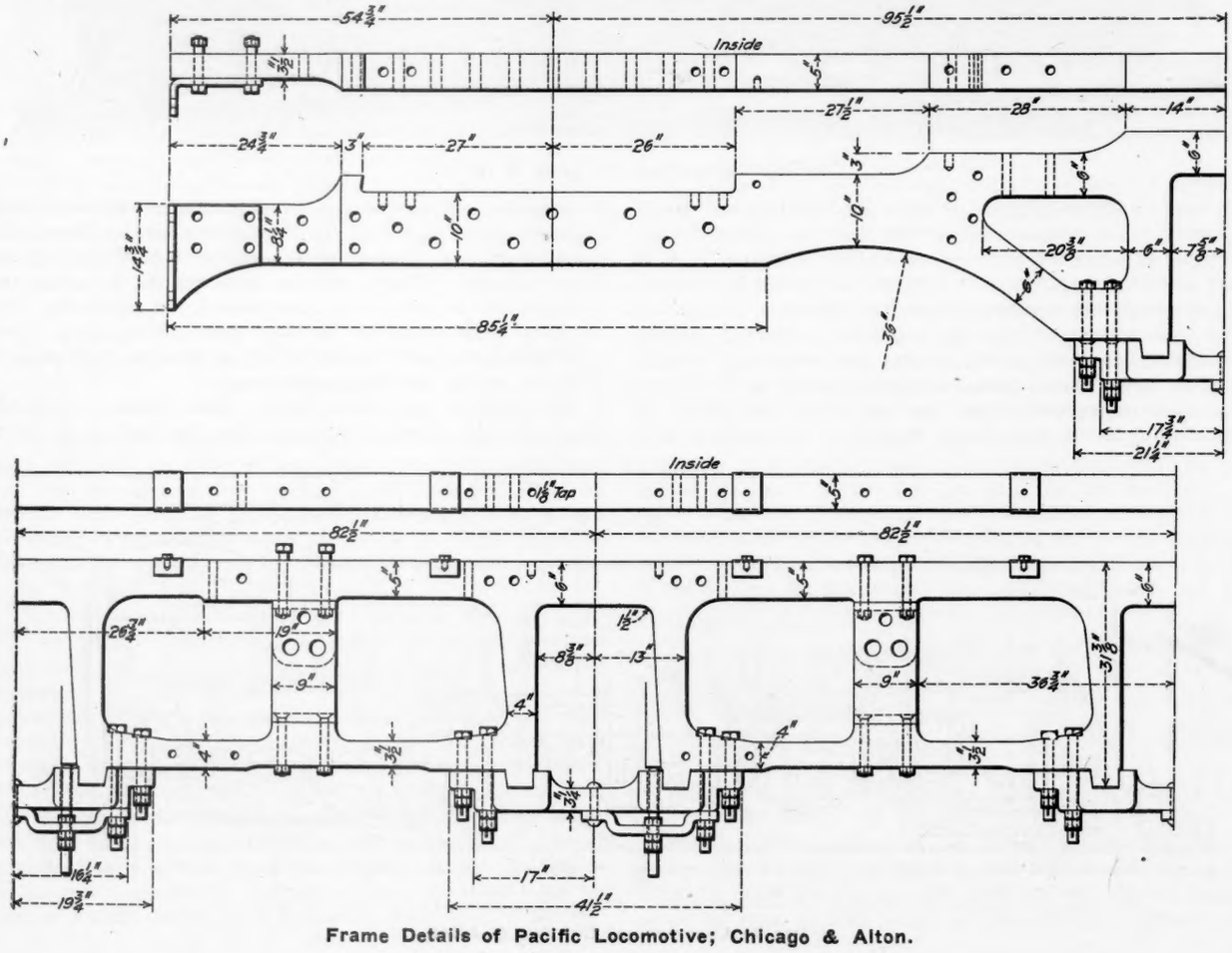
The new locomotives have cylinders 23 in. in diameter by 28 in. stroke. With 73 in. driving wheels and a steam pressure of 200 lbs. the tractive force exerted is thus 34,500 lbs. The cylinders are spaced 90 in. between centers, while the piston valves, 16 in. in diameter, are 98 in. between centers. The maximum width over the assembled cylinder castings is 10 ft. 2 in. The saddle is comparatively low, and the castings are securely fastened together by double rows of bolts in the vertical flanges and two heavy tie bolts 2¼ in. diameter, enlarged to 2½ in. at the threaded ends. The piston valves have cast iron bodies and L shaped packing rings, and the drifting valves are of Pennsylvania Railroad style, with flat plates over the relief ports. Vacuum relief valves are placed in the live steam passages, and a safety valve, set for 225 lbs. pressure, is screwed into each cylinder head. The cylinder heads are of cast steel, and the steam chest heads of cast iron.

The frames, where they are secured to the cylinders, are in the form of single rails 5 in. wide by 10 in. deep, and each cylinder casting being secured to its corresponding frame by nine horizontal bolts, 1½ in. in diameter, and four vertical studs, 1¼ in. in diameter. The cylinders are keyed at the front only. The frames are of forged iron, and are continuous from the front bumper to a point back of the rear driving pedestals, where they are spliced to the rear sections.



Longitudinal Section of Firebox.

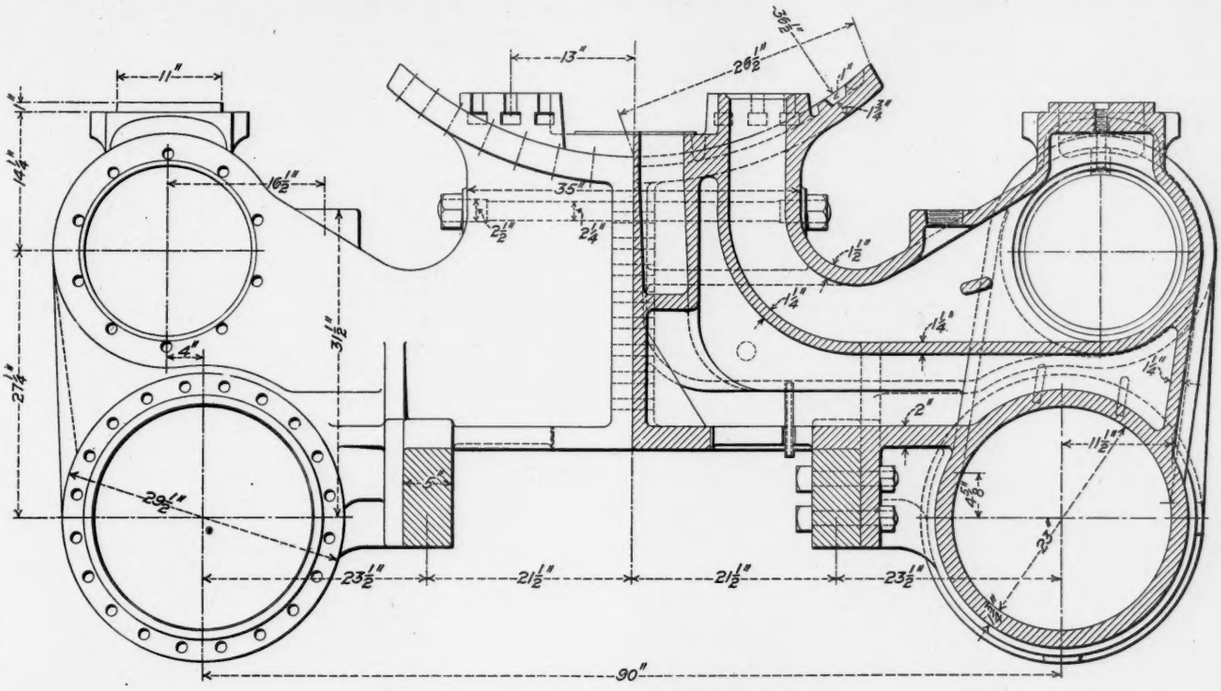
The main frames are 5 in. wide, while the rear sections are in the form of slabs, 2½ in. wide. The splice between the main and rear frames is secured by 20 bolts, 1⅛ in. in diameter, and by two keys which are driven, with their tapered faces in contact, into a single key way having parallel sides. The pedestal binders are of cast steel, and are lugged and bolted to the pedestals. Substantial transverse frame bracing is provided in these locomotives. In addition to a cast steel foot plate at each end, cross ties, of the same material, are placed back of the cylinders; between the first and second pairs of driving-wheels; above the main driving pedestals and in front of the firebox.



Frame Details of Pacific Locomotive; Chicago & Alton.

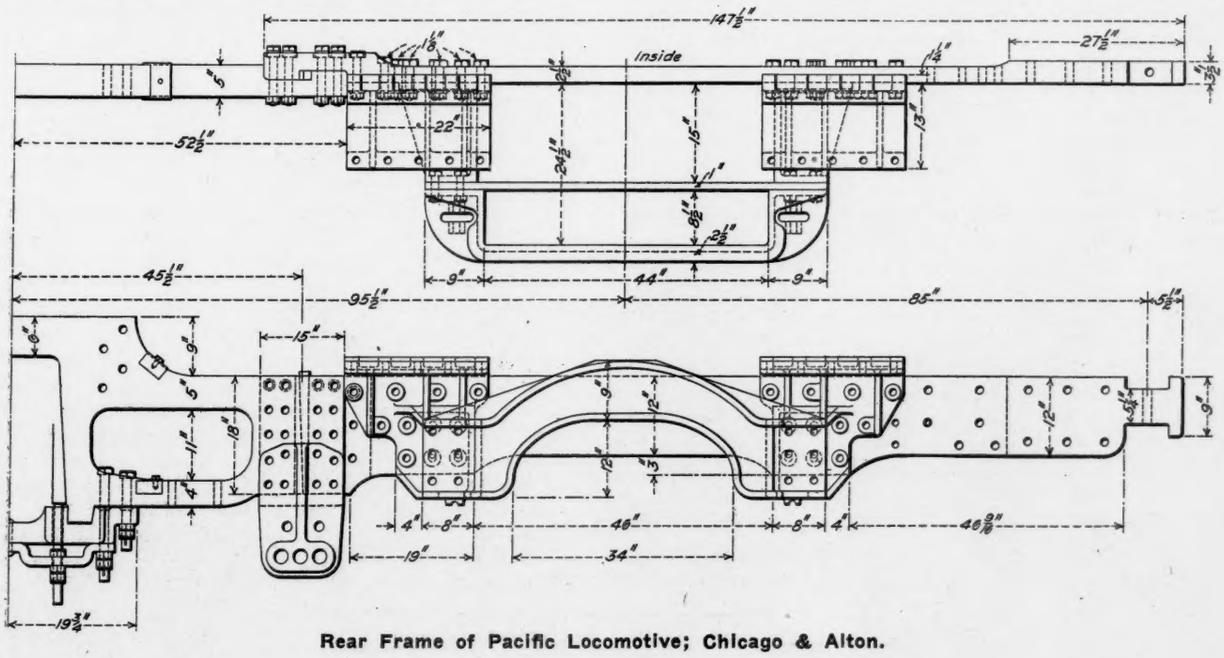
The valve gear details include built-up links, having side plates and end filling blocks of cast steel. Each link is supported by two longitudinal cast steel bearers. These are bolted in front to the guide yoke and at the back to a cross-tie, which also serves to support the reverse shaft bearings. The valve stems are driven through crossheads which are mounted on suitable guides, thus forming a strong and rigid connection for this important part of the gear. The valves are set with a maximum travel of 6 in. and a constant lead of ¼ in. The steam lap is 1 in., and the exhaust clearance 1-16 in.

The leading truck is of the usual swing bolster type with heart-shaped links, and the rear truck is of the Rushton radial type with outside journals. The rear truck supplemental frames are bolted to steel castings which also serve as furnace bearer supports. In this way, the firebox is carried, on each side, by two sliding bearings of ample length. The rear truck is equalized with the driving-wheels in the usual manner. All the driving springs are placed over the boxes, and are mounted on cast steel saddles. The engine and tender truck wheels have cast steel spoke centers, made by the Standard Steel Works Co. The driving-wheel centers and boxes are also of cast steel, and the driving tires are secured by retaining rings. Grease lubrication is provided on all driving axle and crank pin journals. The guides are of the two-bar type, of forged steel, and the crossheads are of cast steel.



Elevation and Section of Cylinder Casting.

As has been mentioned, the boiler is of the wagon-top type with a narrow firebox. Its center line is placed 9 ft. 5 in. above the rail, the diameter is 83 in. at the dome ring and 72 in. at the front end. The longitudinal seams in the barrel have diamond welt strips inside and are located on the top center line. On the dome ring the seam is welded

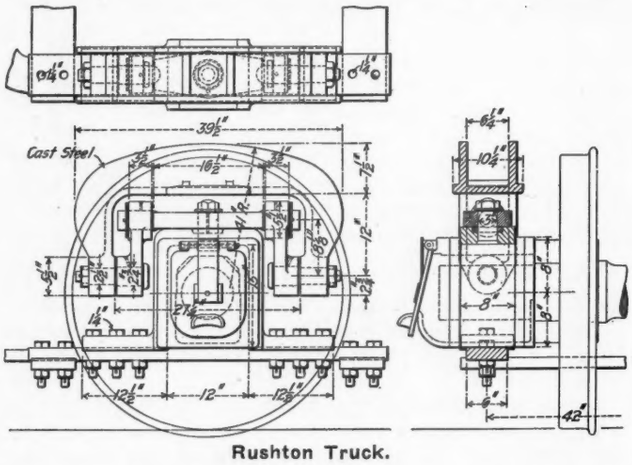


Rear Frame of Pacific Locomotive; Chicago & Alton.

throughout its length on either side of the dome opening. The front end is of the self-cleaning type, without spark hopper. It is equipped with a high single exhaust nozzle and double petticoat pipes. An adjustable plate is located in front of the nozzle, and ample netting area is provided.

The firebox has a sloping back head and roof sheet, and is radially stayed. Four rows of sling stays support the crown in front, while a total of 573 flexible stays are disposed in the sides, back and throat. The crown and sides of both the inside and outside fireboxes are each made in one piece. The fire door opening is formed by flanging both sheets outward and uniting them with a sleeve. The mud ring is of cast steel, double riveted and re-enforced in thickness at the corners. As almost the entire firebox is placed back of the driving-wheels, with the mud ring above the trailers, large radii can be used in the curvature of the side water legs, thus avoiding abrupt changes in direction.

The firebox also shows the tendency to increase the number of flexible stay bolts, which in this case, include four rows at the top, but not the top row, and four rows at the front and back, reaching nearly to the foundation ring. An interesting detail is the combination of stud and rivet used in the riveting of the foundation ring to carry the grate frame. The ring



Rushton Truck.

is double riveted in accordane with what was almost universal practice a few years ago but which has been partially discontinued of late. The entire grate is located in one horizontal plane, and is rocked in three sections. A drop plate is provided at the back. The ash pan is of the hopper type with cast iron bottom pans.

This boiler is liberally supplied with means of washing out. Five blow-off cocks are provided: two in the waist, one in each side water leg, and one in the front water leg. The safety valves are mounted on an auxiliary dome, and the whistle is screwed into the roof sheet immediately in front of the cab. The injectors are located in front of the cab, and they feed through checks placed right and left, 18 in. back of the front tube sheet. The tender is built in accordance with Chicago & Alton standards. The frame is made of 13-in. steel channels, and the trucks are of the arch-bar type with cast steel bolsters.

The table of dimensions shows that these are high-powered machines for passenger service, and as the design has been worked out in the light of experience with locomotives built some time ago, the performance should be satisfactory.

The following are some of the principal dimensions of these engines:

Cylinder diameter	23 in.
Piston, stroke	28 "
Boiler, diameter	72 "
Boiler, shell, thickness	11/16-in. and 12/16-in.
Steam pressure	200 lbs.
Firebox, length	120¼ in.
" width	40¼ "
" depth, front	82½ "
" depth, back	78½ "
Firebox, thickness, sides, back and crown	⅜-in.
" thickness tubesheet	½-in.
" water space, sides and back	4 in.
" water space, front	4½ "
Tubes, material	Iron
" thickness	No. 12
" number	357
" diameter	2 in.
" length	20 ft.
Heating surface, firebox	206 sq. ft.
" " tubes	3,721 "
" " total	3,927 "
Grate area	33 "
Wheels, diameter, driving	73 in.
" " front truck	33 "
" " back truck	42 "
" " tender	36 "
Journals, main driving	10½ in. x 12 in.
" other driving	9 " x 12 "
" front truck	6½ " x12¼"
" back truck	8 " x 14 "
" tender	5½ " x 10 "
Wheel base, driving wheel	13 ft. 9 "
" " engine	32 " 8 "
" " engine and tender	65 " 8½"
Weight on drivers	146,500 lbs.
" " front truck	47,600 "
" " back truck	49,100 "
" total engine	243,200 "
" engine and tender	405,000 "
Tank, capacity, water	8,250 gals.
Tank, capacity, coal	12½ tons
Tractive effort	34,500 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.24$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.05$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 60.23^{*}$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 641.32$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 11.90$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 5.24^{*}$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 37.21$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 61.94$$

$$\frac{\text{Displacement, 2 cylinders, cu. ft.}}{\text{Total heating surface}} = 12.34$$

$$\frac{\text{Total heating surface}}{\text{Displacement, 2 cylinders}} = 253.73$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 2.68$$

*Per cent.

THE RAILROADS OF CHINA.

Since the war with Japan the mileage of the Chinese railroads has materially increased. Including the Manchurian railroads there are now 3,200 miles of road in operation, an equal amount projected and 1100 miles building. In northern China and in Manchuria, Russian influence has decreased considerably. Only the northern part of the through line is under Russian control and Japan controls the southern part. China operates the railroads running north from Peking and is striving, both here and on the Yangste Railroad above Nanking and on the line from Ningpo to Sutschou, to make itself entirely independent of European assistance both in operation and in construction. The road from Shanghai to Nanking, 192 miles long, is in English hands and is to be extended to the boundary of Shantung. The railroads in the Shantung district are under German control. France is active in the southern part of the Empire where it has pushed up its line from Tonkin, and is also interested in the line from Peking to Hankow. The continuation of the line to Canton, however, is to be built exclusively by Chinese capital. In this connection it is interesting to note that the Hanyan Iron and Steel Works at Hankow have furnished a large part of the rails for the 745 miles of the Peking-Hankow road.

TEST OF A MODEL OF THE QUEBEC BRIDGE.

After the failure of the Quebec bridge the Phoenix Iron Co. of its own initiative built and tested a model of the chord that failed. The work was done on its compression testing machine which is the most powerful in existence, and was under the supervision of Prof. W. H. Burr. The model was built to a linear scale of one-third of the lower chord section 9 of the anchor arm truss of the Quebec bridge and was tested to destruction. The purpose of this test was to secure all possible information regarding the circumstances and method or other features of the failure of that chord which could be disclosed by the test of the model column in question.

This chord section was built of four ribs 54 in. deep, with 4 in. x 3 in. x ⅜ in. double angle latticing. Its area of cross section was 780 sq. in.

All the linear dimensions of the model were exactly one-third of those of the full size chord section, making the area of cross section (86,526 sq. in.) one-ninth of that of the full size member and the volume of metal, with the exception about to be noted, one-twenty-seventh of the original member. This exception arises from the fact that the actual chord member as built, 57 ft. $\frac{3}{32}$ in. long, had a heavy chord joint in it 10 ft. 6 in., a little more than twice the depth, from one end. Furthermore, the full size chords were bored for 12-in. pins, and pins of the same diameter were used for the end bearings of the model chord section. It is manifestly impossible to reproduce in a test precisely the conditions existing in the structure at the time of its failure, but it is believed that the end conditions employed in the test and the accurate reproduction by scale of the main dimensions and nearly all the dimensions of the details in the model enable the nearest approach to the actual conditions of the structure to be secured. It is believed that these unavoidable and subordinate departures from the actual conditions of the chord member did not sensibly affect the conditions of failure in the testing machine or the ultimate load carried by the model.

The accompanying engraving shows the model chord precisely as it was built, as well as in its condition after test, the latter plan having been made from accurate measurements of the failed member immediately after its removal from the testing machine. The engraving of the model shows the four webs of the original chord accurately reproduced by scale, making the depth 18$\frac{3}{16}$ in. and the length 19 ft. As the plans of both the actual chord and the model show every main and detailed dimension it is not necessary to repeat them here. It should be stated, however, that each of the two interior ribs were composed of one 18 in. x $\frac{5}{16}$ in. plate, one 18 in. x ¼ in. plate, two 15$\frac{5}{16}$ in. x $\frac{5}{16}$ in. side plates, and two 2$\frac{1}{16}$ in. x 1¼ in. x $\frac{5}{16}$ in. angles; and that the two exterior ribs were each composed of one 18 in. x $\frac{5}{16}$ in. plate, two 18 in. x ¼ in. plates, one 12⅝ in. x $\frac{5}{16}$ in. side plate, and two 2$\frac{1}{16}$ in. x 2 in. x $\frac{5}{16}$ in. angles. The latticing was a double oblique system of 1$\frac{1}{32}$ in. x 1 in. x ⅛ in. angles with 1$\frac{3}{16}$ in. x 1 in. x ⅛ in. crossing angles at the panel points of the former at right angles to the axis of the member. All of these lattice angles had two $\frac{7}{24}$ in. rivets at the ends of each with a single rivet at each crossing of the interior flange angles of rims, as clearly shown on the plans. The linear scale of one-third of the actual dimensions required the rivets used to be ¼ in., $\frac{5}{16}$ in. and $\frac{7}{24}$ in. in diameter, also as shown on the plans, the $\frac{7}{24}$ in. rivets being turned down from an original diameter of $\frac{5}{16}$ of an inch. Similarly the 2$\frac{1}{16}$ in. x 2 in. and the 2$\frac{1}{16}$ in. x 1¼ in. rib flange angles were planed down from 3 in. x 2 in. x $\frac{5}{16}$ in. pieces. The lacing angles were also planed from 1½ in. x 1½ in. x 1⅛ in. and $\frac{3}{32}$ in. angle to the dimensions given above. All rivet holes were drilled.

The method of construction of the model was such as to leave it in true and accurate condition.

In order that the character of the metal employed might be completely determined, tensile tests were made of both plates and angles and shearing tests of both the $\frac{7}{24}$ in. rivets used in the model and ⅞ in. rivets used in the full size chord.

These tests gave the following average results:

Material of Model.

	1½ x 1½ x ⅛ in. angles.	3 x 2 in. x $\frac{5}{16}$ in. angles.	$\frac{5}{16}$-in. plates.
Ultimate strength, lbs.	63,724	62,570	64,810
Elastic limit, lbs.	51,024	42,020	37,810
Per cent. of elongation	23.8	31.67	29.50
Per cent. reduction of area	55.1	57.65	53.1

Material of Original Chord.

	Plates.	Angles.
Ultimate strength, lbs.	62,560	61,986
Elastic limit, lbs.	40,607	39,651
Per cent. of elongation	24.87	29.1
Per cent. reduction of area	50.97	33.32

Ultimate Shear of Rivets.

$\frac{7}{24}$-in. diameter .....59,200 lbs. ⅞-in. diameter.....50,960 lbs.

From this it appears that the metal used in the model had a small percentage of superiority over that of the chord as built for the bridge. The column was accurately placed in the machine with four fine wires stretched throughout its length in the general plane of the upper flanges and with two similarly placed in relation to the lower flanges. These fine wires stretched with constant weights enabled any vertical or horizontal deflections of the tops of the four ribs and the bottoms of the two exterior ribs to be measured by the aid of finally graduated steel scales. Furthermore, longitudinal timber scantlings on the two center lines of the exterior ribs, carrying steel scales at their ends, were used to measure the shortening of the column under loading for 16 ft. of its length to $\frac{1}{128}$ of an inch. While these methods of measurements were not so refined as it might be desirable to adopt in an extended series of tests of this nature, they answered well the purposes of this particular investigation which was not intended so much to determine with refined accuracy all the deformations produced in the test as to discover the main features and methods or other circumstances of failure, so far as possible, which attended the collapse of the full size chord section.

Prick punch marks were made in the heads of the rivets of the lattice bars throughout the length of the upper side of the column as it lay in the testing machine, and the distances between these marked were accurately measured at all stages of the test up to failure in order to ascertain the condition of stress in the lattice angles under the progressive loading to which the column was subjected. Furthermore these bars were tapped with a hammer at the same time in order to secure further information as to their condition of stress as the tone of the resulting sounds might give.

The progressive loading was applied in stages of 3,000 lbs. per sq. in. of cross section of column beginning with an initial loading of that value. At the end of every other stage of each loading, the column was relieved of stress in order to make observations in that condition. This programme was adhered to up to a stress of 21,000 lbs. per sq. in. when the next increment was made 1,500 lbs. per sq. in., after which the column was freed of load. The remaining programme of loading is shown on the plan showing the effect of the test on the column which will be discussed in full below.

After the application of each 3,000 lbs., or finally 1,500 lbs., increment of loading and upon each removal of loading an accurate series of measurements for shortening of the column, for horizontal and vertical deflections at the various panel points of the latticing and for the stretching or shortening of the latticing angles were made.

As for the deflections of the columns they were small and the methods of measuring them were not altogether conclusive as to their amounts or as to their actual existence in some cases. At 9,000 lbs. per sq. in., for instance, three ribs showed an apparent upward deflection of $\frac{1}{32}$ in. at and in the vicinity of the center of the column. This deflection did not appear to increase until the stress reached 18,000 lbs. per sq. in., and then only to an amount less than $\frac{1}{16}$ in., with doubt as to the accuracy of the measurement. No apparent increase of deflection was found again until a stress of 24,000 lbs. per sq. in.

was reached, when the deflection of the four ribs appears to be $\frac{3}{32}$ in., $\frac{1}{32}$ in., $\frac{3}{32}$ in. and $\frac{1}{8}$ in. respectively at center. On removal of the load this deflection disappeared entirely except for $\frac{1}{32}$ in. in one interior rib and the same amount in one exterior rib, both being upward. There was no subsequent opportunity to make further deflection measurements.

Under a stress of 12,000 lbs. per sq. in. one rivet in a lattice angle at the second center intersection from the west end of the column was found loose, but toward the end of the test it appeared to become less so, the conditions of the center ribs probably becoming such as to give it less opportunity for small motion. Up to the final loading all other rivets appeared to remain in good condition although they were frequently tested with a light hammer.

Actual testing of the column with the application of the first loading began at about 2 o'clock in the afternoon of November 21, 1907, and it was continued without interruption in the manner set forth in the preceding statements to 11 p.m. of the same day. At that time a load of 25,000 lbs. per sq. in. was reached for a very short time in the endeavor to attain a stress of 25,500 lbs. per sq. in. This endeavor, however, was unsuccessful in consequence of the leaking of a pump valve (subsequently repaired) to such an extent as to render it impossible to secure the desired pressure in the cylinder of the testing machine.

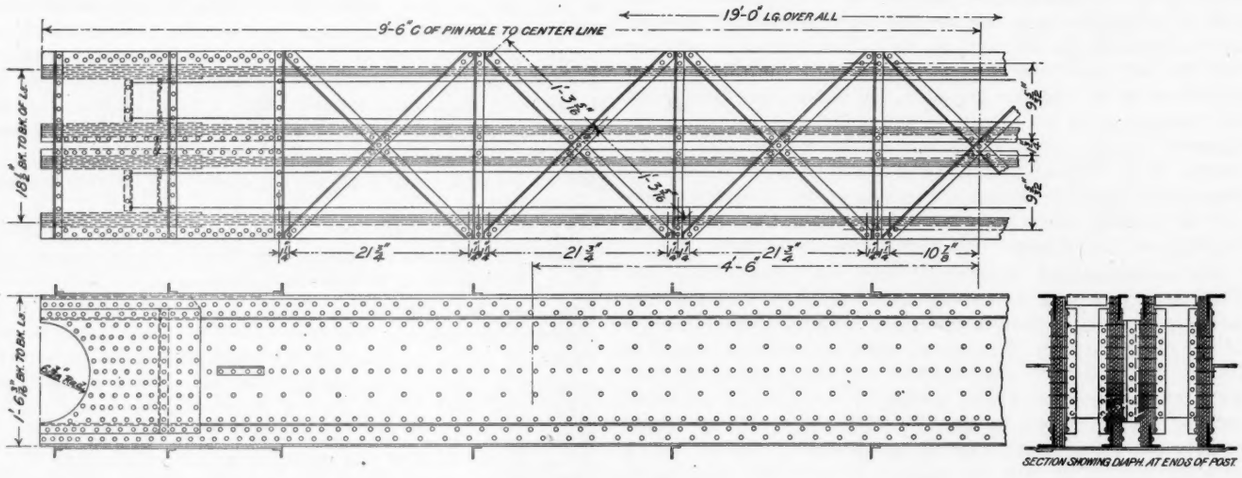
After having attained the above loading of 25,000 lbs. per sq. in. the program of the test was interrupted until 10 a.m., November 22.

At that time instructions were given to load the column to 25,500 lbs. per sq. in. but inadvertence in signaling to attendants at the pump caused the load to reach 26,850 lbs. per sq. in., at which stress the member suddenly failed. This failure was attended by a quick, sharp report, and it occurred so suddenly that three observers who were closely watching the column at the time could not discover any sequence in the yielding of the details of the column; the occurrence was so sudden that all failures of details appeared to be absolutely simultaneous.

Aside from the raising of scale on the pin plates immediately in front of the 12 in. pins, the collapse of the column consisted in the failure by shearing of the majority of the lattice rivets at the central panel of latticing and of a considerable number of other rivets throughout the length of the column in both flanges, loading to the permanent bending to reversed curvature of the four ribs at the same central vicinity accompanied by the violent bending or distortion of the lattice angles and some small dishing of the rib web plates, all as shown on the accompanying engraving. The ribs were all slightly bent immediately beyond the supporting influence of the battens at each end.

There are certain features of this practically instantaneous failure of the column which are highly significant. As indicated in the preceding statements there were no permanent strains or distortions of any kind discovered or apparently discoverable up to the loading producing failure. This observation is certainly true of every part of the column except the $\frac{7}{24}$ in. lattice rivets. If suitable apparatus for refined measurements could have been applied to them some shear distortion might have been observed prior to the final loading. Observations made on the latticed angles showed no permanent stretching or compression of those members prior to failure. The phenomenally high elastic limit of the metal in them shown by the test results in the tabular statement and already remarked upon indicates that they would have exhibited no marked permanent distortion much short of ultimate resistance either as tension or compression members. In point of fact all the circumstances of the test indicated that no main part of the column was stressed up to its elastic limit; in other words, that the entire loading was insufficient to develop more than a part of the elastic resistance of the column as a whole, and that if the latticing details had been stronger the column would have carried a greater load before collapsing. The instantaneous failure was clearly due to the fact that the main parts of the column were subject to elastic stress only.

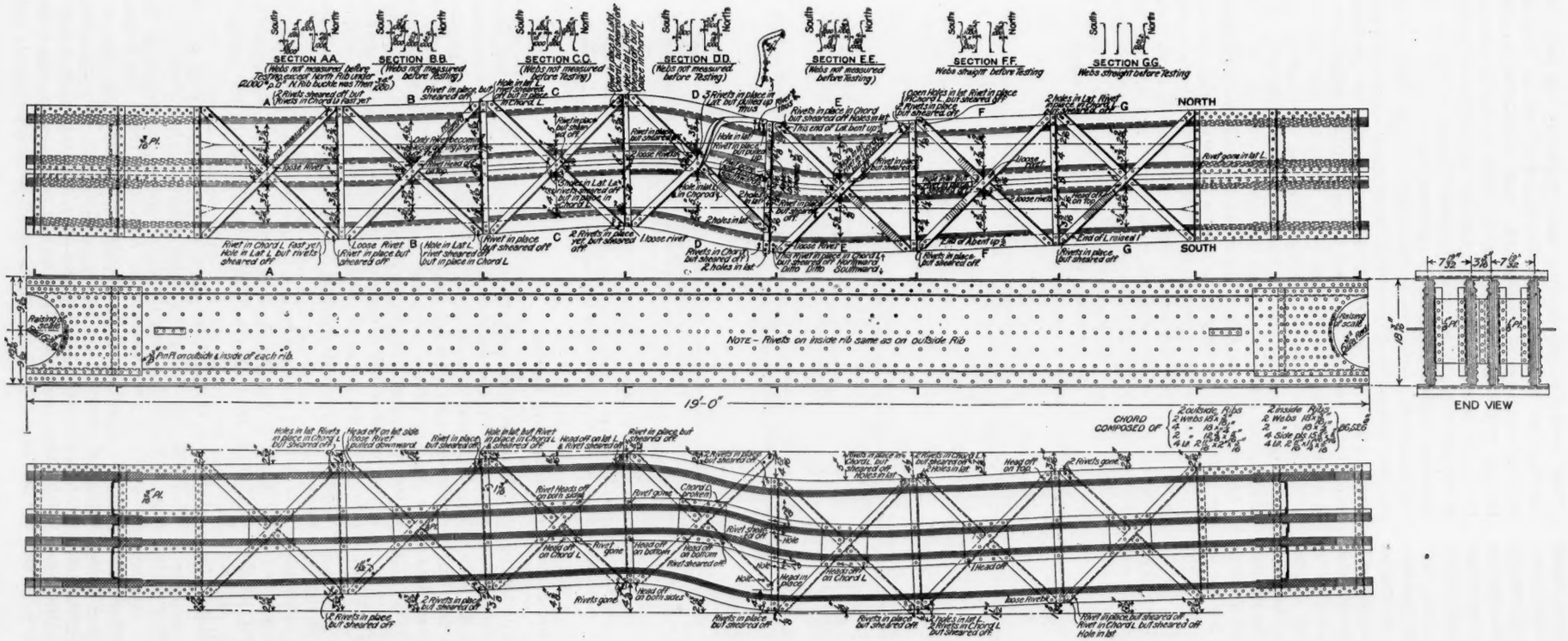
Although it is impossible to correlate accurately the results



Test Chord No. 1.

of this column test with the stress conditions in the actual chord section at the instant of failure, in consequence of the higher elastic qualities of the relatively thin metal in the model column which has greatly been commented upon and the presumably greater care which is usually bestowed upon the manufacture of a model member, an approximation of some value may perhaps be made.

The friction of a hydraulic testing machine is known to be considerable, but without recent calibration its amount cannot be confidently stated. The friction of the machine at the Phoenix Bridge Company's works was determined some 10 or 12 years ago as 17½ per cent. of the total load on the piston as indicated by the mercury gage, and this may be accepted provisionally until a further calibration can be made. If this percentage deduction be made from 26,800 lbs. per sq. in., the apparent stress at which the column failed, it will make the compressive stress in the metal 22,110 lbs. per sq. in. The shear tests of the $\frac{7}{24}$ in. and $\frac{7}{8}$ in. rivets make the average of the latter but 86 per cent. of the former. Hence, if the ultimate shearing resistance of the $\frac{7}{24}$ in. rivets had been the same as that of the $\frac{7}{8}$ in. rivets, the stress on the column producing the failure of the latticing rivets, would have been but 19,014 lbs. per sq. in. of the column. Just what value should be given to the possibly higher excellence of manufac-



Test Chord No. 1 After Failure.

Load, per sq. in.	Duration, Min.	Secs.	Remarks. (All loads held for 5 minutes before observations were commenced.)
3,000 lbs.	14	42	No change in lattice-bar lengths; two north ribs showed 1/32-in. upward deflection at center.
6,000 "	46	16	No change in lattice-bar lengths; chords show 1/32-in. upward deflection at center.
Load off.	40	..	No set observed anywhere.
9,000 lbs.	42	..	No change in lattice-bar lengths; considerable stress in these bars indicated by tapping. Diagonals sounded as if one were in tension and the other in compression. Webs not dished. Three ribs show 1/32-in. upward deflection at center.
12,000 "	47	..	Slight dishing noticeable, .034-in. at west end of north rib; rivets tight; lattice-bars as before. Upward deflection of 1/32-in. at center.
Load off.	30	..	No permanent set; 1 loose rivet as noted on plan; ribs remained dished.
15,000 lbs.	29	..	Conditions identical with those under 12,000 lbs.
16,500 "	4	..	No observations taken.
18,000 "	24	..	Center deflection increased to between 1/32-in. and 1/16-in.; other conditions as before.
19,500 "	3	..	No observations taken.
Load off.	28	..	No permanent set except in length as recorded elsewhere.
21,000 lbs.	5	..	Length only observed.
22,500 "	7	..	Length only observed.
Load off.	13	..	No permanent set.
24,000 lbs.	14	..	Upward deflections at center on the different ribs were: 3/32-in., 1/32-in., 3/32-in., and 1/8-in.
Load off.	28	..	One loose rivet. Upward deflections at center were: 0, 1/32-in., 0, and 1/32-in.
25,000 lbs.	..	..	Test stopped until morning, owing to difficulties with pumps.
Load off.	..	..	One loose rivet. Scale raised in front of both ends of one pin and on one end of the other. No change in length of lattice-bars. Two ribs deflected 1/32-in. upward at center.
26,850 lbs.	..	..	Chord was overloaded by quick action of pump when working for 25,500 lbs. per sq. in., and broke without warning. Failure due to shearing of lattice. Rivets as indicated on plan.

Changes in Chord Lengths According to Loading.

	16-ft. length of North rib.	16-ft. length of South rib.
Under 3,000 lbs. per sq. in.	—1/128-in.	—1/64-in.
Under 6,000 lbs. per sq. in.	—1/32-in.	—1/32-in.
Load off	± 0	± 0
Under 9,000 lbs. per sq. in.	—3/64-in.	—1/16-in. sct.
Under 12,000 lbs. per sq. in.	—1/16-in. sct.	—5/64-in. sct.
Load off	± 0	± 0
Under 15,000 lbs. per sq. in.	—5/64-in.	—3/32-in.
Under 18,000 lbs. per sq. in.	—3/32-in.	— 1/8-in.
Load off	—1/64-in.	± 0
Under 21,000 lbs. per sq. in.	— 1/8-in.	—5/32-in.
Under 22,500 lbs. per sq. in.	— 1/8-in.	—5/32-in.
Load off	± 0	± 0
Under 24,000 lbs. per sq. in.	—9/64-in.	—11/64-in.
Load off	± 0	—1/64-in.
Load, 11 hrs. off	— 1/64-in.	—1/64-in.
Under 26,850 lbs. per sq. in.	Abt. —1/2-in.	Abt. —1/2-in.

ture of the model over that of the full size column is of course not determinable. It may or may not have sensible value. It is to be noted, however, that after making such allowance as is practicable for the friction and the increased resistance of the smaller rivets there is reached an intensity of stress nearly identical with that which existed in the actual chord section at the time of this failure.

It should be carefully observed that the radius of gyration of the normal section of the model column about an axis at right angles to the webs and through their centers, i.e., parallel to the axis of each pin, is $^{5}/_{48}$ in. and $^{5}/_{52}$ in. about a central axis parallel to the webs. Hence, as the column lay in the testing machine, the ratio of its length divided by the horizontal radius of gyration is 35, while the ratio of the same length over the vertical radius of gyration is 42. The column failed therefore in the plane of the greatest radius of gyration. Furthermore, its failure was wholly in a horizontal plane, there being no sensible vertical deflection of the failed column.

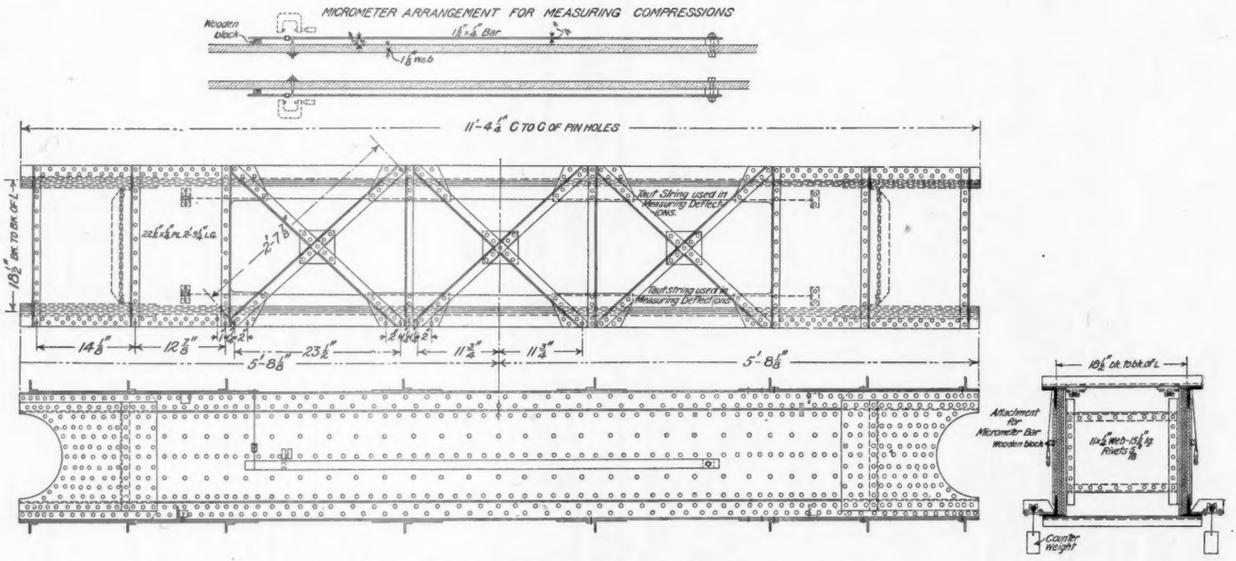
The length of the column was such as to place it practically at the limit between short and long columns, as the ordinary column formulas, such as the much used Gordeon's and "straight line," are properly applicable when the ratio of length over radius of gyration has values greater than about

The failure of the riveting was systematic. In each lattice bay one diagonal connection failed in tension and the other in compression; and usually both failures occurred at the side of the bay farthest from the nearer end of the column. It will be noted that both on top and bottom the diagonals in the center bay failed in the opposite manner to that of the corresponding diagonals in all the other bays.

Some of the lattice rivets were cut out and found to be partially sheared and there were some slight indications that they had been sheared first on one side and then on the other, indicating a reversal of stress in the lattices. That such a reversal would instantly follow the failure of the latticing in the central panel is apparent from the curvature of the chord on one side of the central panel, being opposite to that on the other side.

Subsequent investigation has shown that the method adopted for testing the working of the lattice bars was unsatisfactory. It consisted of measurements between center punch marks on the rivet heads and did not include the effect of rivet shear.

In our opinion the load was more evenly and centrally applied in this test than it would be in the case of a chord in ordinary service. In other words, under working conditions the failure of the latticing of this model chord would have taken place under a smaller stress.



Test Chord No. 2, Showing Measuring Device.

40 or possibly a little more. Inasmuch as the ultimate carrying capacity per square inch of section increases as the length of column decreases, and as this model column was comparatively short, the latticing required to develop its full load carrying power should be relatively heavy rather than light. The shape of the model chord after the test was finished is shown by the engraving.

The following are some of the comments made by the commission concerning this test:

There was little or no indication of failure up to the instant at which it occurred. Failure took place with explosive violence, by the shearing of the outer rivets of the latticing.

Messrs. Schneider, Deans and Szlapka were closely watching the chord when the unexpected failure occurred. No one of these engineers could say what connection or detail was the first to give way.

It was noted that the surface scaled at only three outside pin bearings.

The cross lattice bars showed little sign of stress, rivets being sheared only in those bounding the central bay. Theoretically, under a racking stress in the column, these bars would not come into play, the diagonals only being strained, one set in tension and the other set in compression.

This is the more probable since the model chord was superior to the bridge chord in both material and workmanship. The difference in material is well shown by the test records.

On November 26 some tests on rivet shear were made by the Phoenix Bridge Company, the results of which tests, together with those already given, showed that the rivets used in the bridge would develop an ultimate strength of slightly over 50,000 lbs. per sq. in., and also that the rivets maintained without failure their ultimate strength, even though partially sheared.

On January 14 some further tests were made by the Phoenix Bridge Company which gave similar results. A movement of from $^{3}/_{16}$ in. to ¼ in. apparently took place before actual failure.

This rivet shear offered a reasonable explanation of part of the change in the lengths of the diagonal lattice bars which must have accompanied the distortions of the chords in the bridge which were measured on August 27, 1907. The inspectors had indeed carefully examined the chords and the lattices and reported no evidence of failure, but this rivet shear might easily have escaped their observation; it is noteworthy that no one of the engineers assembled to watch the test of the model chord on November. 21 thought of it, and

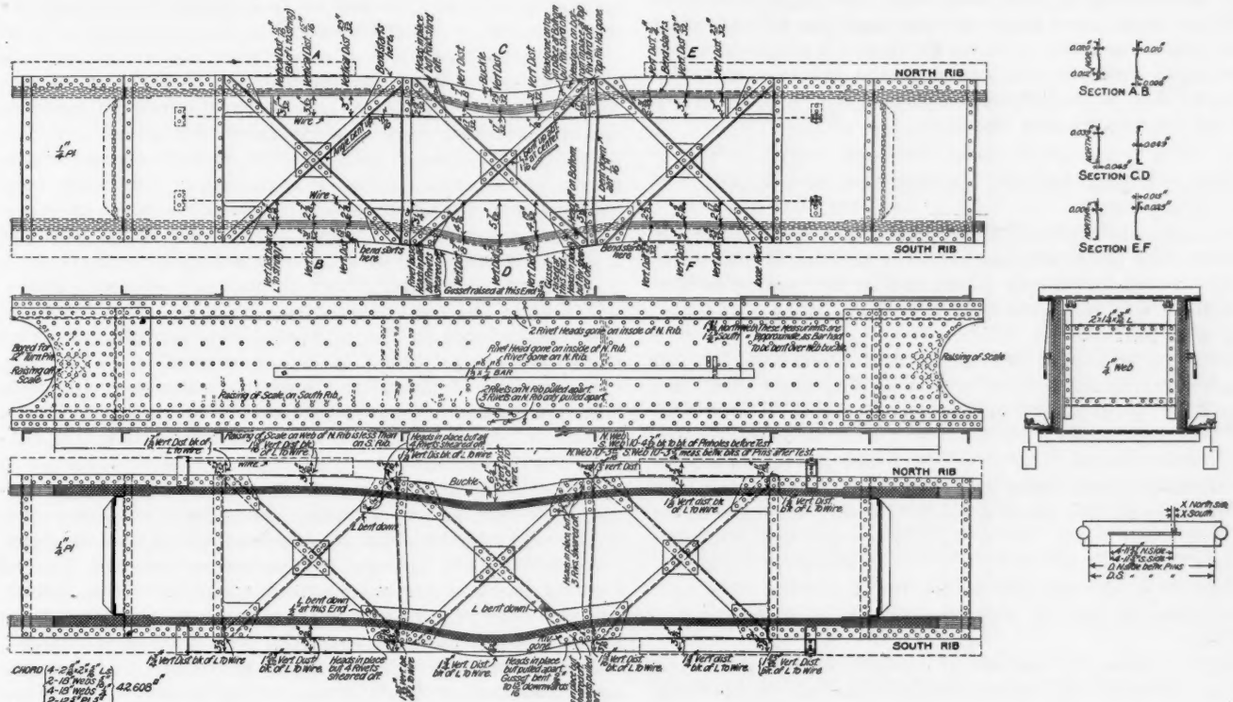
they completely failed to detect such action up to the moment of failure although working under the most favorable conditions. A change in length in addition to the above seemed to be due to the reduced section at the center of one of each pair of diagonal lattice bars.

In December the commission ordered the construction of test chord No. 2 for the purpose of determining the strength of the webs of the design used in the Quebec bridge. The dimensions of this chord are given in the engraving. It had a section half that of test chord No. 1; the number of rivets in the lattice connections was doubled, the section of the lattice bars was increased 50 per cent., and the weak points at their centers were strengthened by the use of connection plates. The webs were of the same section as the outer webs of test chord No. 1. Material from the same heats was used in the manufacture of the two test chords.

failure. The inclination of its webs to the center line on August 27 was very marked near the 8-9 joint (see drawing No. 28). A series of straight edge measurements (see drawing No. 24) was made during the test of model chord No. 2 to determine whether any angle developed at the edge of the cover plate as the pressure increased, but no such movement was detected.

During the test the yielding of the lattice rivets was observed by means of match marks upon the lattices and ribs. The results noted are given on the engraving. They indicate that the pressure was centrally applied and that the lattice bars were not seriously stressed when these observations were taken. Towards the end of the test the lattice bars in the end panels were distinctly bowed upwards owing probably to the compression of the webs.

Scaling at the pin bearings was observed as shown on the



Test Chord No. 2 After Failure.

10 :00 *a. m., January* 18, 1908.—*Put on* 15,000 *lbs. per sq. in. and held it for* 5 *minutes. After load had been off for* 3 *minutes, measurements were taken. Three rivets were found loose.*
11 :04 *a. m.—Put on* 20,000 *lbs. per sq. in and kept it while taking measurements. Tapping of lattice angles gave no result. Of the* 3 *loose rivets,* 2 *had become tight.*
11 :45 *a. m.—Load of* 20,000 *lbs. per sq. in. was taken off. Pin ends of north web showed raising of scale.*
12 :15 *p. m.—*20,000 *lbs. per sq. in. on.*
12 :33 *p. m.—Start to* 25,000 *lbs. per sq. in.*
1 :00 *p. m.—Reduced load to* 4,100 *lbs. per sq. in., making marks between top laterals and gussets. Testing rivets showed the same* 3 *rivets loose again at* 4,100 *lbs. per sq. in.*
1 :20 *p. m.—*28,000 *lbs. per sq. in. on. Tapping gave no result.*
1 :52 *p. m.—*30,000 *lbs. per sq. in. on.*
2 :20 *p. m.—*32,000 *lbs. per sq. in. on.*
2 :32 *p. m.—Load taken off and measurements taken.*
3 :28 *p. m.—Loaded to* 32,000 *lbs. per sq. in.; held it for a few minutes, then increased load to* 33,000 *lbs. per sq. in.*
3 :50 *p. m.—Increased load to* 34,000 *lbs. per sq. in.; slight noise noticed.*
3 :55 *p. m.—Increased load to* 35,000 *lbs. per sq. in.*
4 :00 *p. m.—Increased load to* 36,000 *lbs. per sq. in.*
4 :04 *p. m.—Increased load to* 37,000 *lbs. per sq. in. Distinct noise in center panel noticed.*
4 :07 *p. m.—Chord failed under load of* 37,000 *lbs. per sq. in.*

This chord was tested at Phoenixville on January 18, the observations made during the test and the shape of the chord after failure being shown on the engraving.

It will be noted that this chord failed under a stress of 37,000 lbs. per sq. in. by the buckling of the webs in the center bay, the latticing being sufficiently strong to fully develop the strength of the webs. The nominal strength of the column (the record has to be corrected for an unknown machine error) was slightly less than the elastic limit of the metal in the webs.

In this test the column seems to have been loaded evenly and centrally since the latticing was not seriously stressed.

The following notes concerning this test are of interest: There was some reason to think that chord A-9-L might have been bent sharply at the edge of the cover plate previous to engraving, but this was about the same at all four surfaces at the bearings and did not indicate that there was any racking strain on the chord.

The dishing of the webs during the test is shown on the engraving.

It will be noted from the measurements on engraving of the distorted model chord No. 2 that there were practically no horizontal or vertical movements of the chord webs with reference to the chord ends to which the reference wires were attached.

In January the commission made three tests on full size lattice bars, for the purpose of determining their strength and the amount of yielding of the various parts of the length as the tension increased. In each case failure took place at the center of the lattice bar under an ultimate load of 59,800 lbs.

Other tests by the Phoenix Bridge Company gave 61,266 lbs. Other tests of rivets in single shear averaged 63,625 lbs. and 62,800 lbs., while for double shear the load rose to 122,266 lbs.

It will be noted from the above that the riveting was sufficiently strong to develop the full strength of the cut lattice bar and yielding took place simultaneously in the rivet connections and in the reduced section at the center of the bar.

As the first test chord failed by shearing of the rivet connections and as no indications of failure at the center of the lattice bars were noticed, the result of the tests on the full size lattice bars was unexpected.

A series of tests on the lattice bars of test chord No. 1 was made by direction of the commission, but the results were not wholly satisfactory. Observations made show that up to the moment of failure there was little yielding either of the rivets or of the reduced central portion, and that the failure took place in each case by rivet shear.

Further tests were made to determine the slip of rivets connecting parts under compression, in which it appeared that under light loads the slip was much the same as in tension tests, and that, as the loading increased, the web of the I-beam and not the riveting gave way.

OBJECTIONS TO THE DEPRECIATION CHARGE.

The American Railway Association's special committee on relations with the Interstate Commerce Commission has issued a memorandum containing a summary of the views expressed by railroad officers on the subject of depreciation. The summary is as follows:

First.—To attempt to fix the rate of depreciation in percentages of original value is at best nothing more than "estimating" or "guessing"; it is not "accounting":

(*a*) Because no two roads are alike
(*b*) Because no two years are alike

} On account of difference in character of equipment owned, difference in character of service, and difference in volume of service.

Second.—At the hearing before the Interstate Commerce Commission, on May 22, 1908, the Statistician of the Commission said:

"It is not alone the purpose of depreciation charges to protect the investor; the correct determination of net operating revenue per month and per year is equally important, and from the public point of view of relatively more importance."

If the theoretical accrual of liabilities for depreciation proves to be different from the facts (as it necessarily will be in every case) it will be necessary later to make adjustment debits and credits to expenses, and probably some very large ones, in order that "net operating revenue" may not be incorrectly stated. Even then the current statements "per month and per year" will inevitably be more or less out of joint.

Third.—If the refinements of accounting which are now sought are to be accomplished, the transportation companies will be compelled to add a force of bookkeepers to each workshop, and then the shop expense will include not only labor for repair and renewals of equipment, but this additional expense which would benefit neither the carrier, nor the public.

Fourth.—In establishing depreciation percentages, what allowance should be made from time to time for the use or non-use of equipment?

Fifth.—In the matter of obsolescence, who is competent to predict what types will be considered desirable or efficient 10, 20 or 30 years from now, and therefore, what retirements will be expedient on different roads?

Sixth.—If the Commission is now justified in establishing an arbitrary depreciation charge on equipment, it will logically be followed by depreciation charges on bridges, buildings, rails, ties, fences, telegraph line, block signals, and structures of all kinds. This means more estimating and more subsequent readjusting, and also more unnecessary expense.

Seventh.—Railroad executives take the position that property accounts should be as sacred as income accounts. They concede that the Commission is right in endeavoring to show all liabilities; but they contend that to anticipate liabilities by setting up reserves, while it may display a well-meant prudence, actually involves a mis-statement of facts, and is, therefore, not good "accounting."

It is suggested, with a good deal of force, that it is the duty of the board of directors of each railroad company to determine from time to time, according to the facts as they exist, when and to what extent charges should be made against income on account of depreciation which has actually occurred, and also to determine the proper means of providing for meeting these charges, either out of the company's surplus, or otherwise. Has the Act to Regulate Commerce taken from these boards of directors any of their authority in these respects, or relieved them of any of their responsibilities? In other words, has the Commission a legal right to compel railroads to make charges in order to create reserve accounts against liabilities which it is estimated will occur?

Eighth.—The theory upon which a monthly charge for depreciation is proper, is that it is a liability which has been incurred, and should, therefore, be stated; howbeit, it is admitted that this liability cannot be definitely determined and must be estimated in advance from experience tables. If it is the duty of railroad officers to state all estimated liabilities, then by the same token many other estimated liabilities must be included in the accounts. For example, whenever there is a personal injury, or any accident of any kind, causing loss of life or damage to property, an estimate of the probable cost of making settlements should be included; in the same way, an estimate of the cost of settling outstanding lawsuits should be included.

Ninth.—The idea of creating "reserve" or "suspense" accounts, to take care of estimated liabilities, is not a new one. It has been tried by steam railroads, as well as by many other corporations. For instance, the experiment has been tried of creating suspense accounts, against which rails, ties, ballast, car and locomotive repairs and replacements, and other large items of maintenance or operation, were ultimately charged. But it is the consensus of opinion among the best accountants that such methods result in misleading, rather than truthful returns. If, as it is assumed, correct accounting should show actual expenditures, actual outlays, actual liabilities as they are determined, then the method of charging for expenditures, which have not in reality been made, is not only objectionable, however well meant, but it causes a false return instead of a statement of actual facts.

Tenth.—This is a practical question, as well as a theoretical question, because financial problems with railroads are as practical as the movement of trains. It is not only wrong from an accounting standpoint, but as wrong morally to understate income as it is to overstate it. Again, at a time when the credit of railroads is at a low ebb, any diminution of net revenue reflected in their exhibits immediately becomes a very practical question on account of a consequent further lowering effect upon the company's credit and the consequent impairment of its ability as a semi-public servant.

Eleventh.—It must not be understood that railroad executive officers are opposed to making charges against operating expenses to make good losses due to depreciation. While it is contended that with buildings, structures or equipment properly maintained, there is no depreciation except that due to obsolescence, still it is desirable to make good the losses due to obsolescence. The points upon which the views of railroad officials differ from the views expressed by the Statistician for the Interstate Commerce Commission, are simply these:

(*a*) That depreciation due to obsolescence cannot be accu-

rately determined in advance, and hence any liability resulting from such obsolescence may be "guessed at" but cannot be accurately gaged in advance;

(*b*) The value of the assets of any company of every name and nature varies from time to time according to business conditions, and it is the duty of the board of directors, acting for the stockholders, to determine how any loss in the value of assets shall be made up;

(*c*) In considering any shrinkage in the value of assets, full consideration must also be given to any appreciation in their value. There is usually some appreciation in the value of right of way, terminals, land, town lots, roadbed, and in the value of switch connections, business affiliations, etc.;

(*d*) The practice which seems best justified by experience is to make good losses from depreciation of this kind out of earnings in years of plenty, not only by the full restoration of the physical property by ample maintenance expenditures, but also by the replacement of obsolete structures or equipment with more modern or more efficient structures or equipment;

(*e*) The executive officers of railroads assume that the Commission desires in the accounts a full, accurate and complete statement of facts for the benefit of public interest, as well as for the protection of investors.

A PRACTICAL SOLUTION.

Twelfth.—There has been no better argument on the whole subject than that contained in Comptroller Mahl's paper of October 7, 1907, from which the following paragraph is quoted:

"Appreciating, therefore, all the difficulties and cost which the keeping of the equipment accounts as contemplated by the Commission will impose upon the railroads without any practical compensation therefor, the writer expresses the hope that the Commission will amend its rules by omitting altogether the provision for 'depreciation,' and amend the provisions for 'renewal' to represent the current cost of replacing all equipment vacated. This change will furnish the Commission with reliable data about the depreciation which has been carried into the operating expenses of the railroads and enable it to order adjustments suitable to each case if any such should be necessary."

THE MADEIRA & MAMORE RAILROAD.

P. B. Shelmerdine has lately returned from the Madeira river, where he went as a representative of the Baldwin Locomotive Works to set up locomotive No. 32,679 for use by the contractors in the second attempt to carry out this difficult undertaking. The brief story of his observations, which is printed below, recalls the great tragedy of 30 years ago, when in 1878 the promoter, Colonel George E. Church, backed by Mr. Gowen, of the Reading; Colonel Thomas A. Scott, of the Pennsylvania, and other Americans, made a disastrous failure. The money loss was enormous. Nearly one-fourth of those who sailed in ships from Philadelphia to the Amazon and Madeira were drowned or killed by malignant fevers, while hardships and jungle fevers damaged to an extent not measurable the health of the engineers who survived.

Bolivia has more than half a million square miles; is rich in gold, silver, iron, coal, rubber and lands for grain and grazing. It has no sea coast, and on the west the Andes mountains form a barrier, not insurmountable by railroads, but a costly obstacle which when surmounted still leaves a long route by the Pacific ocean and Cape Horn to reach Atlantic ports. From the Atlantic ocean the Amazon is navigable, as is also its tributary, the Madeira, to within about 150 miles of the northwestern boundary of Bolivia. The building of about 240 miles of railroad from this point, rounding the rapids of the Madeira and the lower part of the Mamore river, would make accessible the navigable waters of the Mamore and its tributaries in Northern Bolivia. It would open an empire to trade.

It is only recently that the project has been revived by the British bondholders, and the railroad is now being built by a British company with P. G. Ashmead, Chief Engineer; Mr. Engelsen, First Assistant Engineer; Mr. McMillan, Master Mechanic, and May, Jeckyll and Randolph, Contractors.

Mr. Shelmerdine's story of his trip is as follows:

When I arrived at Manaos I met P. G. Ashmead, of Philadelphia, Chief Engineer. The following day I left Manaos in company with Mr. Ashmead and went up the Madeira river to Portovelho. On the way up he mentioned to me the history and condition of the Collins locomotive, built at these works about 1878. I asked him why he could not put this engine in service again and he said it was too far gone, but the Sunday after our arrival the Master Mechanic and I went up to San Antonio, three miles from Portovelho, to examine it. All the brass work and fittings had been taken to Manaos and sold, and the side rods and many of the other parts had been stolen. We made a note of the parts which were needed, and I estimated that they could be bought from the works for $1,000 or less.

The smokebox door was open and the dirt and dust had accumulated in the smokebox and a tree had grown out of it. The left-hand steam chest cap had been taken off and there was a bush about 2 ft. high in the steam chest. The locomotive is now surrounded by buildings, and one of them would have to be removed to get it out. The tank has been used as a reservoir for drinking water for years.

The cab and tender frame, built of wood, have entirely disappeared, either rotting away or having been eaten by ants. The Master Mechanic approved of putting the locomotive in order and we came to the conclusion that it could be done by getting new parts from the works. Then we examined the firebox and found that when the engine was abandoned they had left 4 in. of wood ashes in the firebox. These with the moisture had formed a chemical which had attacked the side sheets and they were just like paper. It was therefore decided that at present no steps should be taken to put the engine in service, but they will be in better condition by high water (January, February and March) to overhaul the locomotive. I took a photograph of the locomotive and various other interesting things, but the films melted and when I got home none of them were good.

The railroad starts at Portovelho and is to run to Garupe, 329 kilometers, 19 rapids. Of the five miles built by the Collins expedition, the rails are all there, but the ties are gone. Between Portovelho and San Antonio there is a granite cut 350 ft. long by 12 ft. deep, which they are blasting out now. South of San Antonio is the old Collins track of 45-lb. rails and 100 tons or so of unused rails, which are still apparently in fair condition, except a shell of rust on the outside. The railroad runs on the south side of the Madeira river. After the first 30 kilometers there will be no deep cuts or fills, nothing over a meter.

At present they are using about 30 flat cars built in the United States. A machine shop is being erected. The British bondholders are supplying the money to build the railroad, for which they are reimbursed by the Brazilian government upon the arrival of material in Brazil. This matter I do not quite understand. There are two engineers who examine all the material when it is landed and they put their approval upon it. When I suggested overhauling the old Collins locomotive* they did not see how they could bring it about, as there was no appropriation for repairing.

The richest mines in the world are supposed to be in Bolivia. It costs $285 per ton to take material out and $325 per ton to take it in that country. When the railroad is finished the price can be reduced considerably. Supplies are moved in canoes. The rapids are from 20 to 30 miles long.

They have a great deal of trouble on account of fevers. The

*The locomotive above referred to was built by the Baldwin Locomotive Works, for the Philadelphia & Reading Coal & Iron Co. No. 4203, Col. Church No. 1, Baldwin Class 8-18½ c. 8, built 1877.

average time during which a person can keep his health is ten weeks. About 2,000 men are employed, mostly Gallegos. There is a large hospital built of lumber, one doctor at Portovelho and one other up the line. There is only one man who has been there three months who has not had malaria—that is the First Assistant Engineer. There are about 20 houses which are built of cedar, mostly from the United States.

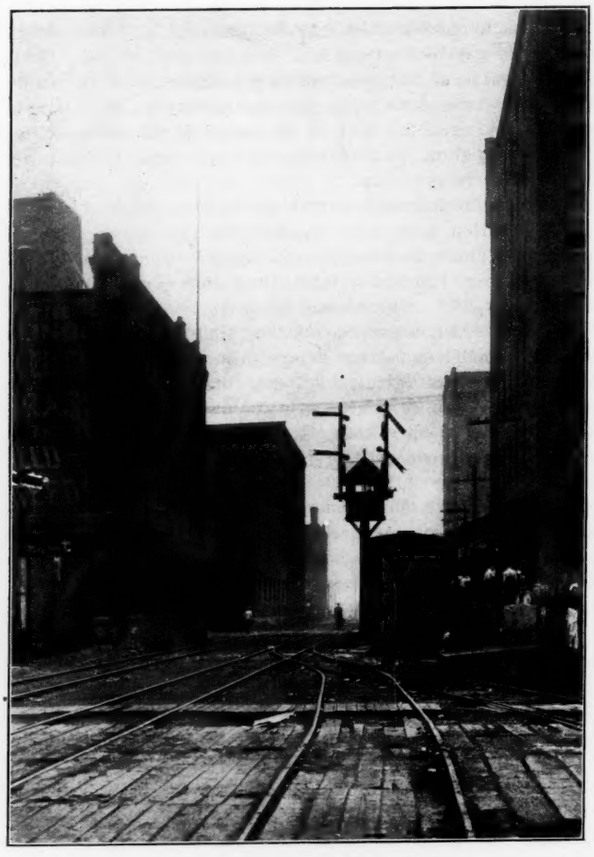
The insects are very annoying, especially a very small one called "Pium." Mr. Jeckyll killed a boa constrictor about 20 ft. long. A friend and I took a walk in the jungle one day and in a short time were lost, but we were fortunate enough to find our way back to a clearing.

The water rises about 40 ft. in the wet season. The thermometer registers from 11 o'clock to 3 about 115 deg., and in the early morning about 60 deg. The cold is very hard to bear.

CHICAGO TERMINAL TRANSFER TRACK ELEVATION.

The Chicago Terminal Transfer Railroad is completing the elevation of a rather difficult section, about two miles long, of its line along Fifteenth place, Chicago. The work is just north of the Sixteenth street work of the Chicago, Burlington & Quincy and the Chicago & North-Western, described in the *Railroad Gazette*, May 10, 1907, and is being carried out under the same ordinance.

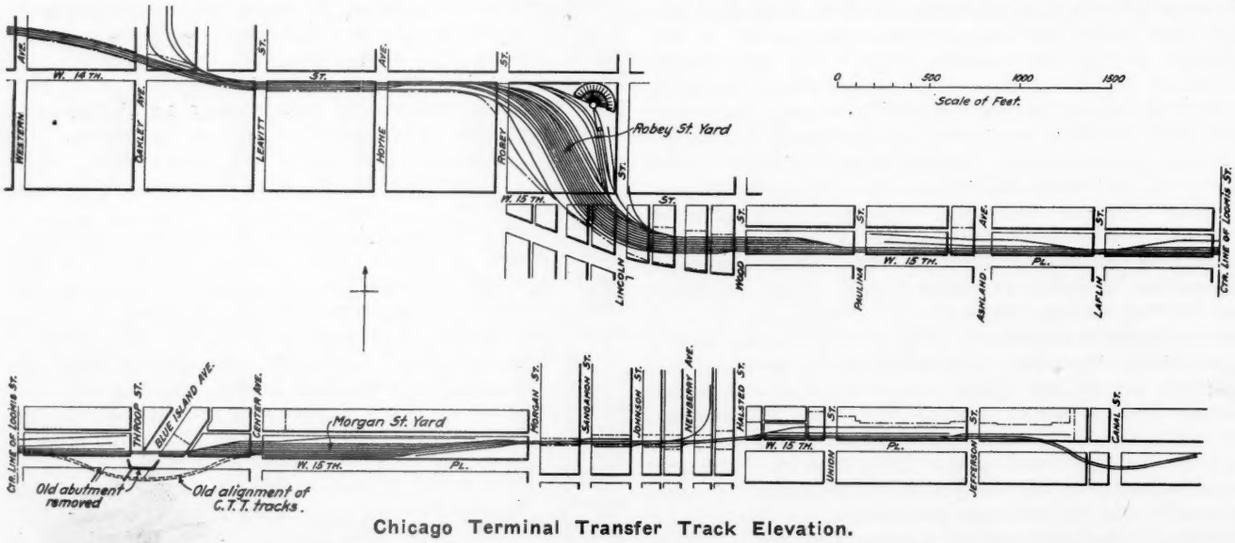
The Chicago Terminal Transfer is the Chicago entrance for the Baltimore & Ohio the Pere Marquette and the Chicago Great Western, which use its passenger terminal—the Grand Central station—at Harrison street and Fifth avenue. The east end of the section just elevated is not far from this station, and about 100 train and light engine movements a day had to be taken care of while the work was being done. The line is double track, on a right-of-way which at some points is quite narrow, adding to the difficulty of the work. One of the accompanying photographs shows a section where the right-of-way, for a city block, is only 33 ft. wide, and runs between high buildings. For several blocks east of this the width is only 50 ft. The retaining walls had to be built and the tracks raised in this narrow space with a train or engine movement over the line on an average of every 10 minutes, exclusive of the construction trains which were used in the elevation work.



Narrow Right of Way, Before Elevation.

The accompanying plan shows the portion of the line covered by the elevation ordinance. The work includes the raising of Robey street yard, but it was decided not to begin this until the line east of the yard had been finished. The present work, therefore, extends from Wood to Canal street, leaving the part west of Wood street to be done next. A small yard at Morgan street was raised with the main line, and the alinement of the latter changed at Blue Island avenue, as indicated on the plan. This avenue is on a skew with the tracks and also intersects Throop street at the railroad crossing. Formerly it was carried over the tracks on a viaduct and the relation of this viaduct with Throop street made necessary the irregular alinement which the removal of the viaduct and elevation of the tracks eliminated.

Including the work here described, the Chicago Terminal Transfer has about eight miles of elevation work to do under ordinances already passed. In preparation for this work, which on account of the complicated conditions the company decided to handle with its own forces, a considerable amount of equipment was provided, including a lot of side-dump cars of 100,000 lbs. capacity for hauling the filling material. They



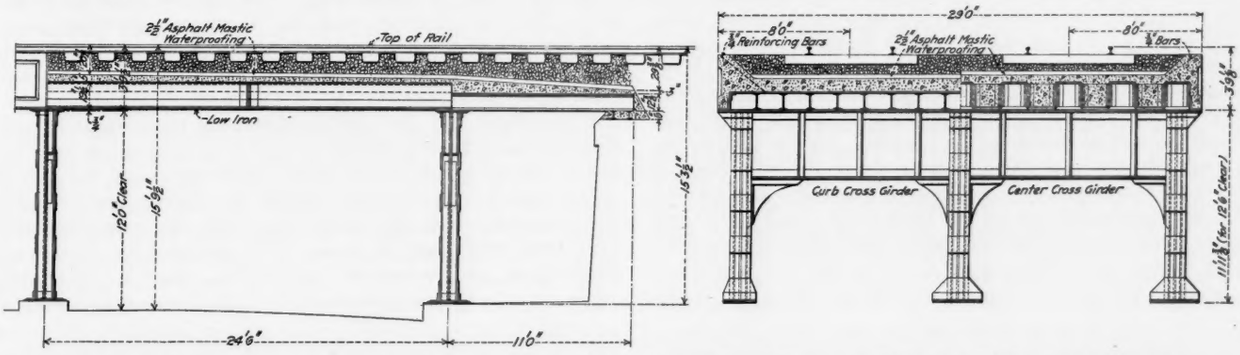
Chicago Terminal Transfer Track Elevation.

are of a design suitable for carrying coal, stone, etc., and will be used regularly in this traffic.

West of Blue Island avenue the right-of-way is 150 ft. wide, while east of that avenue is Morgan street yard and the narrow right-of-way referred to above. On the wide right-of-way, temporary main tracks were laid north of the old line, far enough away to clear the slope of a three-track bank, this section requiring a south retaining wall only. The land on which the temporary tracks were laid was formerly occupied by coal yards. They are to be replaced by the team tracks shown on the plan. The temporary tracks were connected with the Fifteenth place, the traffic then being on elevated tracks all of the way from Wood to Union streets.

During the work, the line from Blue Island avenue to Union street was single track and trains were run over it by telephone. The men in charge of the two ends were experienced freight conductors, the one at the east end being in control. There was also a telephone station at the middle of the section for the convenience of the men on the track elevation work.

On the narrow right-of-way east of Morgan street, extreme care had to be taken in the different stages of the work so



Longitudinal Section and Cross Sections Through Sidewalk and Road Spans of Standard Right Angle Crossing.

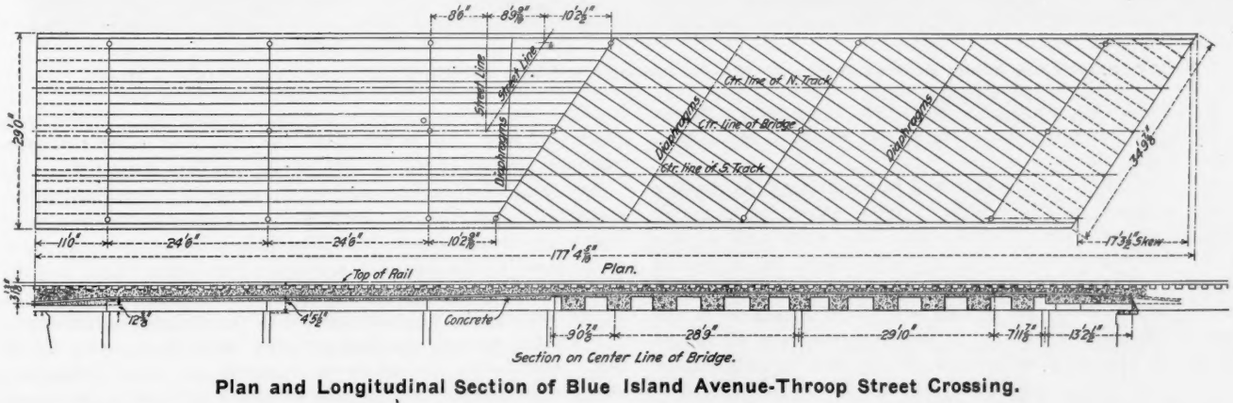
curve at Blue Island avenue, leaving a clear stretch between Loomis and Wood streets to be raised without hindrance.

The method here used was to build a light trestle resting partly on the retaining wall, capable of sustaining the weight of the cars, but not of a locomotive. The filling material was plowed from the cars with a 60-ton-pull Lidgerwood unloader, and was spread with a Jordan ballast spreader when the bank got high enough. The filling material, which was sand with some loam mixed with it, was brought in 30-car trains from a pit on the line about 10 miles south of the work. When this section had been filled, a trestle, with approaches at each end, was built over Throop street and Blue Island avenue, so placed as to permit the retaining wall to be built from Loomis street to Center avenue. Meanwhile, an approach was being built at Wood street, and when the whole was ready, traffic was transferred from the temporary tracks to the elevated ones, coming down on the east end at Center avenue.

A temporary main track was next laid in Fifteenth place south of Morgan street yard, this part of the street, under the ordinance, having been raised to the height of the elevation. One main track east of Morgan street was then abandoned and a trestle built above this track. This trestle was of a design requiring four piles to each bent, but because of the narrow limits, only three were driven, the retaining wall on the south side taking the place of a fourth row of piles. A run-off from the trestle was built at Union street and traffic changed to the trestle and the temporary track in that one move would not block another and unnecessary delays result. Work was begun at the east, or Halsted street, end, the outfits backing toward Morgan street as the work was completed. Most of it was done from the track on the ground, though a part of the concreting, and the filling, of course, had to be done from the trestle.

The raising of Morgan street yard has been mentioned. The small freight yard between Halsted and Jefferson streets, which is leased to the Chicago, Milwaukee & St. Paul, and the team tracks between Throop and Paulina streets were also raised. The latter are built on a 2 per cent. grade, their entrance, at Laflin street, being at the street level and their opposite ends at the full elevation. The two subways under the yards are crossed by highway bridges.

The regular subway bridges, one of which is shown here-



Plan and Longitudinal Section of Blue Island Avenue-Throop Street Crossing.

with, are similar in design to those of the Kinzie street elevation work of the Chicago & North-Western described in the *Railroad Gazette*, November 10, 1905. In the present design, however, the troughs of the street spans are about one-half wider than those of the former design, and the sidewalk spans are I beams instead of shallow troughs. At right-angle crossings, the bridges are 66 ft. long between abutments. One here shown is the Blue Island avenue-Throop street crossing where special conditions had to be met. An extra long bridge—162 ft. between abutments on the center line—was necessary, and, because of the length of the street span over Blue Island avenue, the troughs were put on a skew

to the side girders to avoid increasing their section or providing additional support. The Throop street portion follows the standard for a right-angle crossing.

The retaining walls, bridge abutments and column foundations are concrete. All the concrete rests on piling. The first 7 or 8 ft. of the soil is fairly hard material, beneath which is a very soft stratum 20 to 30 ft. thick. The piles were driven through the latter to hard-pan. The concrete for the body of the walls and abutments was a 1:3:6 mixture, 1:2½:5 for the coping, and 1:2:4 for the bridge seats and pier caps. Instead of sand, limestone screenings were used, principally because that material was easier to get than good sand. The walls were built in sections 25 ft. long, two sections being erected each day by a gang of about 45 men and the necessary mixing outfit. These two sections were made a day's work, regardless of the time taken, and the men then allowed to quit. The arrangement, the primary purpose of which was to avoid horizontal joints in the concrete, proved economical, the men working exceptionally well under it. The footings were built at about twice the rate of the body and allowed to harden thoroughly before putting on the upper part. For bonding, short pieces of old rail were used. There were three mixing outfits, each comprising a Smith No. 2½ mixer run by a 15 h.p. Otto gasolene engine, mounted on a flat car. There were no delays from machinery breakage. The concrete forms were built for repeated use, some of the sections being used as many as ten times.

Alinement at Blue Island Avenue before Change. Chicago & North-Western Elevated Tracks on the Right.

Robey street yard is to be enlarged in elevating it by moving the east entrance, which is now at Wood street, eastward to Paulina street, as shown on the plan. The work west of this yard, to Western avenue, will be complicated by operating conditions, but will not offer the engineering difficulties of the part already done. E. N. Layfield, Chief Engineer of the Chicago Terminal Transfer, is in complete charge of all of the work, and to him we are indebted for the data for this article.

Consul-General Norman Hutchinson, of Bucharest, reports that several high officials of the Austrian railroads have arrived in Roumania for the purpose of studying the question of petroleum as a railroad locomotive combustible. The consul-general adds: If it is found that the use of petroleum as a locomotive combustible is working satisfactorily upon the Roumanian railroads, it is intended to introduce the use of petroleum upon the Austrian railroads. Petroleum does away with coal dust and cinders, but the odor of smoke issuing from the locomotive is offensive to many persons, while others consider it more or less healthy.

ENFORCED RAILROAD COMPETITION.*

The main fabric of American railroad legislation rests on two principles, which are all but irreconcilable with each other: first, that carriers serving the same or adjacent territory must compete with one another; second, that rates for like and contemporaneous service under substantially similar circumstances and conditions must be the same to all comers —that is to say, not competitive—and that one city or territory must not be built up at the expense of another (long-and-short-haul clause); a process which is directly and naturally the result of competition. The Act to Regulate Commerce prohibits pooling, and the Sherman Anti-Trust Law apparently makes every kind of trade agreement between persons engaged in the same kind of business an act of conspiracy, so that Congress has strongly affirmed the competitive principle; yet the 1906 revision of the commerce act makes it specifically impossible for a carrier to change its rates without giving thirty days' prior notice to the Interstate Commerce Commission, unless the Commission exempts it by special action, an exemption which the commissioners have been very loath to give. This provision is, of course, along lines the reverse of competitive, since a thirty-day-notice cut-rate to move competitive traffic is about as effective a device as setting a tortoise to catch a squirrel. So the railroads are told with blunt plainness that they must compete, and are then immediately reminded that they must not.

Are we, as a nation, correct in assuming that individual competition should be enforced by law—and, whether it should be or not, can it be? The fallacy of the Sherman Law originates in the national reverence for competition, and in the lack of clear thinking on the way competition works out, in its varying forms. As applied to the railroad situation in the United States, the discouraging fact about competition legislation is that it was given an exhaustive trial in England fifty years ago, at which time certain truths were developed at great cost which, so far as we are concerned, need never have been developed at all, since we have not noted the relation of these truths to our own problems, but are proceeding independently, at still greater cost, to develop the same principles in this country.

Charles Francis Adams showed that it had always been the theory in England that the railroads ought to compete, until the commission of 1872 demonstrated that in the forty years since railroads began, English railroad legislation had never accomplished anything which it sought to bring about, nor

*From a paper in the September *Atlantic Monthly* by Ray Morris, Managing Editor of the *Railroad Age Gazette*.

prevented anything it sought to hinder. Thirty-three hundred useless enactments had cost the companies £80,000,000, but the commission reported that competition between railroads existed only to a limited extent, and that it could not be maintained by legislation. The commission cited the case of the North Eastern Railway, formerly composed of thirty-seven independent, competing, and more or less bankrupt companies, but in 1872 (as to-day) prosperous and giving general satisfaction, and found that in view of such facts as this it was clear that amalgamation had "not brought with it the evils that were anticipated, but that in any event, long and varied experience had fully demonstrated the fact that, while Parliament might hinder and thwart, it could not prevent it, and it was equally powerless to lay down any general rules determining its limits or character."

Our national attitude toward consolidation of steam railroads which from their geographical location are presumed to be competitors, is perfectly uncompromising; so uncompromising that, practically speaking, it is unenforcible in its entire purview—like the Sunday liquor law in New York. The disheartening thing about a law like this, whichever one of the examples we take, is the opportunity which it gives government to be unscrupulous. When the Duke of Alva was "pacifying" the Netherlands, in 1568, a writ was issued from Rome, sentencing all the people of the Netherlands to death, on the heresy charge. The Duke did not really intend to execute all the people in the Netherlands, but it was very convenient for him to have authority to make such selections as he chose without undue formality.

This situation affords a pretty good historical parallel of the possibilities of governmental procedure against railroads and great industrial combinations under the Sherman Anti-Trust Law. There are few indeed of the railroad systems of the country that really know whether their skirts are clear of the entanglements of the law, as it has at present been construed; and it is hard to see how any large industrial company can avoid being a combination intrinsically in restraint of some other man's trade, and hence illegal. To all intents, the government can exercise the widest choice in its selection of victims; a condition which gives opportunity for unlimited favoritism, and tends to inject a personal element into prosecutions.

The futility of the enforced competition legislation, when actually carried out, needs but a single instance—the Northern Securities case. James J. Hill controlled the Great Northern Railway and was influential in the Northern Pacific, but these lines had no proprietary access to Chicago, coming no nearer to it than St. Paul, and Ashland, Wisconsin. The joint purchase of the Chicago, Burlington & Quincy by the Great Northern and the Northern Pacific, in 1901, was really designed primarily to afford a perpetually friendly route into Chicago, the absence of which had handicapped the Hill lines in securing what they considered a full share of transcontinental traffic. To thwart this plan, Mr. Harriman and his associates, as everybody remembers, began buying Northern Pacific in the open market in March, 1901, and actually got control of that property by a narrow margin—the price of stock going from $58 a share to $1,000 during the process. Both parties saw the futility of cut-throat competition, however, and compromised the matter by forming the Northern Securities Company, which ultimately held a very large proportion of the capital stocks of the Great Northern and Northern Pacific. The Northern Securities Company was bitterly opposed in the Minnesota courts, and was dissolved by the United States Supreme Court in 1904, on the ground that it was a combination in restrain of trade.

Well, let us see what happened then. The Northern Pacific was the original bone of contention. The device of the Securities Company kept the Northern Pacific (and one-half of a half control of the Burlington) equitably poised between Hill and Harriman; the distribution required by the dissolution of the Securities Company by the Supreme Court decision was pro rata, and resulted in leaving an absolute monopoly of three companies in Mr. Hill's hands—the Great Northern, (which he started with), the Northern Pacific (with which Mr. Harriman went into the Securities Company), and the Burlington, which had been divided between the Great Northern and the Northern Pacific.

The Northern Securities decision was widely heralded as a positive governmental affirmation of the principle of enforced competition—but does it appear that any important reduction in monopoly was effected thereby? Apart from the technical result of the decision, Mr. Hill got absolute control of 8,000 miles of parallel and competing lines of which he previously shared control with Mr. Harriman. His monopoly in the American Northwest was strengthened, not weakened.

The original purpose of the Sherman Anti-Trust Law was undoubtedly to restrain manufacturing, rather than transportation, combination. Let us see what it accomplishes here.

The law did not require Eli Whitney to invent the cotton gin, nor was it instrumental in producing the sewing machine, or the power-loom, or the steamboat, or the telephone. In the great preliminary steps of economic development it was scarcely a spectator, but now that this development has been carried on and on, under conditions of constant betterment from within and of constant pressure from without, the law fears that the great natural force of competition which brought all this about is going to vanish from the earth, and that the collectivism which tries to put production on a basis of assured profit is going so far that the great industrial combination will have the power to make its own terms with its customers, concerned not with efficient service, but only with the exaction of the last farthing. It has a certain justification for this fear in the obvious fact that in modern industrial development the chance of the small individual producer is constantly tending to become less, and it reasons from this that the opportunity of the consumer to buy cheaply is also disappearing. Hence the great combination should be thwarted at every turn; it should be fined to death, or taxed to death, or broken in pieces, and its place taken by a host of lesser producers, competing among themselves, and therefore necessarily content with small profits, and keenly awake to the chance to improve their efficiency and skill.

This is perhaps an acceptable outline of the point of view which underlies enforced competition legislation; it is based on the entirely correct belief that competition, in one form or another, is responsible for most of our economic development, and that we should be badly off without it. But from this impregnable position it proceeds to two lamentable fallacies: first, that competition can be killed by combination; and second, that it can be maintained by legislation!

Just as soon as combination gets two or three or more competing streams of industry diverted into the same channel and attempts to raise prices it invites fresh competitors into the same field, and also stimulates invention and resourcefulness to provide substitutes. Sometimes one of these effects is produced; sometimes the other, sometimes both together. It follows, therefore, that the successful combinations are those which use their organization to effect economies which keep the distribution price of their products just a little too low to tempt outsiders. The four corners of the world are tied so tightly together nowadays by steam and cable that competition has a long arm: American meat and meat products compete in Europe, not only with European producers but with Australia, New Zealand, and South Africa; Denmark and Devonshire place their dairy products side by side in the London market, with a slight advantage in favor of Denmark; and oil from Kansas and Texas must be sold at an extremely low figure in Calcutta if it is to compete with oil from Baku.

We have heard much about the "Beef Trust" in the last few years, and a considerable element of the daily press has

actually maintained with bitterness that a group of Chicago packing houses could make prices for meat as high as they chose, in utter disregard of the fact that cattle, sheep, hogs, and chickens can be raised in every state in the Union, and that thousands of local butchers would be delighted to undersell the "trust" if current prices were high enough to make it profitable. As a matter of fact, this omnipresent local competition is felt especially strongly in the provision business, and there is perhaps no other large industry where the margin of profit is smaller in proportion to the capital tied up. The net profit which a great packing house derives from buying a steer, slaughtering it, and selling the meat and the by-products is around $2, or approximately four-fifths of the commission which a banker gets for the combined purchase and sale of a bond,[1] with the important difference that the banker gets spot cash or marketable collateral to cover his capital expenditure, while the packing house pays spot cash for what it buys, but has to carry an open account unsecured for what it sells. Yet the government has been so afraid of combination in this industry, and has taken such vigorous steps to prevent it, that the Chicago packers no longer dare meet together to settle details of mutual helpfulness.

The very fact of the ease with which competition takes place in the provision business accounts for the concentration of capital in the gigantic packing plants at Chicago, Kansas City, and Omaha. As in nearly every other manufacturing industry, concentration brings efficiency with it; every one of the by-products can be developed to the highest commercial degree, and profits are made, not by raising prices but by eliminating waste. There is no doubt that the small, independent butcher finds it harder to make a living than he would if the great plants were not able, by their efficient organization, to sell meat a thousand miles from where it is dressed, at the smallest fraction above cost; but there is nothing in this situation to cause the consumer uneasiness. It is possible to demonstrate the truth of this in a striking manner by means of the industrial statistics collected by the Bureau of Labor, not only in the provision industry, but in others which may be selected as highly organized.

Thus, if we take the average price of cattle for the year 1890 to 1899 as a base, represented by the figure 100, and the average price of dressed beef for the same ten years at the same base figure, the Bureau shows us that the packers, as the largest purchasers, paid 114.2 for their cattle in 1906, but sold the beef for 101.2 per cent. of the base price. This is a very striking demonstration of the effect which a highly concentrated and much-attacked industry has had in keeping down the price of the finished product as compared with the cost of the material from which this product was worked up. And the figures can be carried further; for example, the price of sheep went from 100, in the years 1890 to 1899, to 132.6 in 1906, while the price of mutton went from 100 to 120.7, in the same period; the price of hogs, from 100 to 142.2, while the price of hams went only to 125.5 of bacon to 139.9 and of lard to 135.6. The price of all farm products (non-concentration of capital) was 28.6 per cent. higher in 1906 than in 1898; the price of beefsteak (concentration of capital) rose only 14.2 per cent. in the same period.

Much has been said about the "Sugar Trust," as representing an oppressive economic system, and the activities of this trust, along with all the others, are supposed to have become much more baneful in the last decade than in former times. Note, then, that the average price of sugar was 4.7 per cent. less in 1908 than it was in 1901, and 3.1 per cent. less in 1906 than it was in 1898. As regards the effect on prices which the Standard Oil Company has brought about, it is interesting to see that the price of crude petroleum, which the company buys, was 175.8 in 1906, as compared with 100, average of the 1890 to 1899 decade, while the price of refined oil, which it sells, was 131.8 in 1906. In the steel business, the price of Bessemer pig rose from 100 to 141.8 during the same comparative period; the price of rails rose only to 107.4. The reader will understand that these figures do not represent dollars and cents, but the percentage-cost of the commodity when the prices from 1890 to 1899 are compared with those for 1906.

It would be possible to cite many more examples illustrating the tendency of raw materials and manufactured articles representing no concentration of capital to increase in price faster than those articles produced by concentration of capital and the supposed elimination of competition. To take a few illustrations at random: candles (concentration, non-competitive) were 2 per cent. cheaper in 1906 than in 1890-99; axes (non-concentration, competitive) were 43.1 per cent. dearer; hides (raw material, competitive) rose in price 64.7 per cent.; leather (concentration of capital, reduced competition) increased 20.4 per cent.

The government, in its arraignment of the Standard Oil Company, admitted freely that the combination has not made prices burdensome, but argued that it might have made them cheaper. It seems only necessary to ask why it should have made them cheaper, with the cost of labor and of raw materials tending almost uniformly upwards. The opinion may at least be hazarded that the Standard Oil Company would long ago have been defeated in a battle against the impossible if it had attempted to force its current prices so high as really to tempt competition—which is another way of saying that the price of oil, if produced under conditions of small individual manufacture, would not be any less than it now is. As regards the special advantages which are charged against great corporations—rebates, and the power to shut out local competition by temporarily underselling—it is not necessary at present to discuss the rather technical question whether these advantages are fair or unfair, in comparison with the ordinary trade methods of free competition. The point is that you cannot, as alleged, achieve greatness with these methods; you must start with greatness in order to achieve the methods! When railroads and steamboats and oil companies used to drive one another out of business by underselling, it was not necessarily the wickedest company which came out ahead; it was the best organized company.

Now observe where the Sherman Law has led us, while we have been digressing! Does the wickedness of the great combinations lie in their efficiency in obtaining rebates (that is, wholesale rates) for transportation? Perhaps it did so lie, prior to the Elkins Law—it depends largely upon one's definition of wickedness—but rebates are essentially a competitive device, and the enforced-competition doctrine can have no quarrel with them. In what, then, do the great combinations so offend as to bring upon themselves the Sherman Anti-Trust Law, the law of enforced competition? Besides their former ability to obtain privileged transportation, they have only two other advantages over the small producer: one is efficiency—the ability to buy more advantageously, to manufacture at a less cost per unit, to sell in a wider market; the other is the power to undersell local territory and spread the cost over world-wide territory, or else charge it to profit and loss.

Theoretically, the power to undersell small competition and drive it out of business, is accompanied by the subsequent power to make prices far higher than the small competitor would have made them; practically, it does not work that way, because the effect of the high prices would be to attract to the field a host of competitors, big and little, who would continue to charge the citadel of the monopoly over the fallen bodies of the vanquished until the monopolistic ammunition gave out. The Bureau of Labor unit-costs, quoted above, afford concrete illustrations of the attitude of the largest industrial organizations in the country; these organizations tend to keep prices stable, but to lower, rather than raise them, in comparison with the cost of the raw materials they purchase.

If the great corporations offend because they are efficient, we must logically commend small enterprise because it is in-

[1] Excluding rent, taxes and depreciation of property in each case.

efficient; if they offend because they undersell, we must praise the local manufacturer who is unable to undersell. Manufactured articles we must have; therefore we must buy them from the concern which is inefficient and weak, since the law forbids combination for purposes of strength and of efficiency. Does anybody suppose that this is going to benefit the consumer?

Probably nobody believes so—and yet everybody feels the force of the livery-stable argument, mentioned above, or recalls some similar instance where he has seen competition work wonders, and he fears that the great corporation is going to remove competition from the earth. After all, the difficulty between the citizen who fears the "trusts," and the citizen who believes in them, is largely a matter of definitions. Fundamentally, it is impossible so to define the word trust as to make it akin to our purpose at all; but if we spell it with a capital and give it the duty which the newspapers assign to it, we should suppose that the timorous citizen, and his representative, the Sherman Law, would define it somewhat as follows:

Trust—A combination of corporations which is in restraint of trade, eliminates competition, and oppresses the consumer by charging him higher prices than would otherwise prevail.

On the other hand, the courageous citizen, who has done some thinking on his own account, and is not afraid of trusts at all, succeeds in locating the difference between the Standard Oil Company and the un-competed-with livery stable by creating for himself a definition something like this:

Trust—A combination of corporations to increase efficiency, which, by means of this efficiency, reduces competition by selling more cheaply than any but the most efficient of its competitors can sell.

* * * * These remarks apply to industries which are of such nature that they are naturally and readily subject to competition. But when the Sherman Law includes railroads in its purview, it is attempting to deal with an industry which is naturally monopolistic. It is more or less generally recognized that the effects of competition fall short of any usefulness in certain public-service enterprises. Nobody saves telephone bills by living in a city which is served by two or three competing telephone companies. Even if the toll-rate is low, two or three cheap services cost more than one dear one, and a business man must have them all. This is a case where monopoly is convenient to the consumer; a street railway in a crowded district usually furnishes a case of monopoly which is inevitable. The clearest thinkers in all countries now concede that regulation furnishes a better solution in safeguarding the public welfare than competition does, throughout a fairly long list of what are generally termed public-service enterprises. The most conservative of these thinkers believe, probably without so much as raising the question in their own minds, that police forces and sewer systems are branches of the public service which can best be provided for by the municipality itself. It is also quite universally conceded that the control and supply of a city's drinking water ought to be a regulated monopoly rather than a competitive industry. There is difference of opinion whether better service is obtained from waterworks owned by private capital or from waterworks owned by the municipality, but this point is alien to our discussion.

Further down on the list come lighting and heating plants, telephones and street railways.

* * * * It must be said in all frankness that in former days, when street railways were given franchises freely, and very little was required of them, the results to the public were extremely good, and there is reason for expressing doubt that the present tendency to scrutinize franchise privileges with extreme care and to reduce street-railway fares by franchise contracts is going to work as well. The average citizen would rather go over the whole city for five cents than be able to go over only half of it, even if he can get over that half for three cents; and capital has little inducement to build extensions to meet the city's growth in such places as Cleveland, Detroit, or the Canadian cities and towns where much is being asked of the street railways and little is being allowed them in the way of opportunities to earn. But even in the cities where the street railways have been most harassed, competition has not been advanced in good faith as a permanent way of bringing about better service, and in cities where street railways have been able to keep out of local politics, nobody advocates it at all.

The steam railroads have given ample demonstration that nobody gets any permanent profit from cut-throat competition between them. In the ten years when the general competition in this country was most severe, say from 1870 to 1880, the shipper might get an exceedingly low rate on a competitive transaction, but was quite sure to get an exceedingly high one to compensate for it on a transaction in noncompetitive territory. At all events, he never knew six months, or even one month, ahead, what his rate was going to be, and the uncertainty attendant upon this state of affairs worked a great deal of harm and resulted in a thousand forms of discrimination, intentional and unintentional, on the part of the railroad. Moreover, the lines which felt the competition most were in wretched physical condition, and were unable to better themselves. This was particularly true in the South. Albert Fink pointed out that, in the rate wars prior to the formation of the Southern Railway and Steamship Association, gross earnings of the southern railroads were reduced about 42 per cent. below what regular rates would have allowed; an amount in many cases equal to the whole net earnings which could have been derived from the competitive business at the regular rates, so that the business was really unprofitable, and the roads were, in consequence, practically worthless to their owners. In 1876 a committee of the stockholders of the Central Railroad & Banking Company of Georgia reported: "It is conceded that the property of your stockholders is on the brink of being sunk forever, and the bankruptcy of a number of your roads is imminent, if not even now a fact." Of course, roads in this condition could not afford to make their facilities better or to give their country a better service in any way. They had no surplus net earnings for betterment work, and nobody wanted to buy their securities. It was not until the great consolidations like the Southern Railway, the Atlantic Coast Line, and the Seaboard Air Line got the situation well in hand that the South began to have a decent railroad service. Prior to that time, the best and strongest companies always had to compete with the bankrupts; a process which does not good to a well company or a sick company, or to the territory which either of them serves.

S. W. Dunning, with his long experience as a close observer and critic of railroad affairs, used to say that the people who built the West Shore Railroad did more harm and caused greater destruction of property than they would have done if they had gone around burning barns all along the route; and this simile portrays pretty well the workings of unrestricted competition. The shipper gets a high rate one day, a low one the next, and confronts a constant tendency on the part of the hard-beset railroad company to "scamp" its work; the railroad company works at cost in one locality and on a basis of exorbitant profit in another, and engages in a long struggle with bankruptcy, while the investor realizes that he has made a mistake, and resolves to keep out of such enterprises in the future, or else to require an extremely high potential return on his investment.

This, in brief, was the effect upon railroads and upon the interests they served, in the period of maximum free competition. The particular harmfulness of this kind of competition to railroads arises from the fact that the capital invested in them must perform its work just where it is, no matter how great the disadvantages, so that the bankrupt that has given up trying to pay fixed charges has powers of harmfulness almost unlimited. It is surely to our discredit as an in-

telligent people that we should try to maintain this kind of free competition by law!

The odd fact about the present activity in enforcing the Sherman Law is that it comes at a time when everybody has been enabled to observe that, in practice, great corporations and great railroad combinations do not operate to force rates up. People ought not to be afraid of bigness in concerns any longer, and they ought not to cherish the illusion that they really want to be served by small concerns doing business at a loss. The cheaper a given service can be performed the less people are going to have to pay for it, in the long run, and it has been shown over and over again that consolidation means efficiency, and that sharp competition means waste; also, that the cost of killing the loser and buying his useless plant must be borne by the winner's customers. Competition means duplication of facilities for doing the same work, and the theoretic economic loss of this duplication is habitually converted into a practical loss either in dollars or in efficiency, with a rapidity which far outstrips many of the economic processes that rejoice in our full belief and confidence.

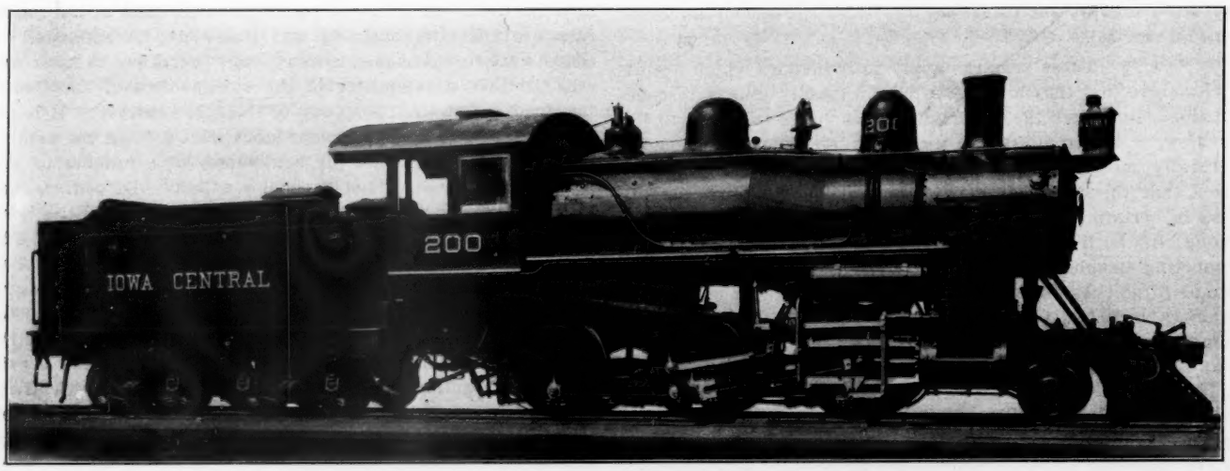
Many conservative people will concede, without argument, the contention that excessive competition, with its bankruptcies, its discouragement of new enterprises, and its constant incentive to discrimination, is undesirable; but they feel, nevertheless, that a condition where competition is entirely absent would be worse. Granting that it would be, does not the weakness of the Sherman Law lie in the fact that it overlooks the constant working of potential competition? Apart from its direct effects, giving the strongest inducement to industrial combinations to keep prices at a figure where they will not serve as a constant temptation to new comers, potential competition finds constant exemplification in the principle of "charging what the traffic will bear." It has often been pointed out that the common interpretation of this principle is wrong. In the language of W. M. Acworth, charging what the traffic will bear is not the same thing as charging what the traffic will not bear! A certain New England railroad has made a rate on pulp wood which, in itself, would barely pay for coal and train crew's wages. It does this in order to open up a new territory, so remote from the market that the pulp wood which it produces cannot be sold at all unless the railroad rate is carefully adjusted with this in view. This road does not get its profit from the pulpwood traffic; it gets it from opening the territory to mills, farms, and minor manufactures, with coal and materials to be hauled in, and some little general traffic to be hauled out, besides the staple. It has accomplished this by charging only what the traffic will bear.

This is a single instance of countless cases where railroads and industrial combinations alike have to determine the rate at which they can make the most profit; and it has again and again been proved that it is better in all industries to do a tremendous business at a very small margin of profit than to do a very small business at a large margin of profit! In parallel efforts to reduce prices for the consumer, the Sherman Law has always to compete with the forces of enlightened selfishness, and enlightened selfishness is continually successful, while the Sherman Law has never succeeded at all!

It should not be inferred from this argument that the writer believes that railroads and industrial combinations should be free of regulation in the public interest. Certain police powers are just as necessary to the national government as they are to a municipal government; certain kinds of corporate conduct, such as the practice of giving rebates to favored shippers, may certainly be determined to be contrary to public policy without violation of economic laws. But the attempt to confer a public benefit by requiring universal competition in place of consolidation is just as absurd in theory as it is unattainable in practice.

MOGUL ENGINES FOR THE IOWA CENTRAL.

The Baldwin Locomotive Works have recently built six mogul locomotives for the Iowa Central. These engines are designed for freight service, and exert a tractive force of 33,400 lbs. The general plans were prepared in accordance with drawings and specifications of the railroad company, although many of the details were designed by the builders.



Mogul Locomotive; Iowa Central.

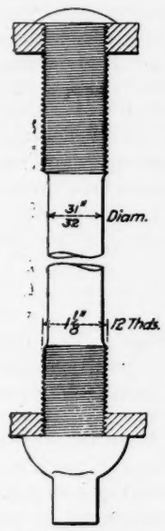
During recent years the mogul type has been largely superseded by locomotives having more elaborate wheel arrangements and greater steaming capacity, in proportion to their tractive force. For general freight traffic, however, where the requirements are not too exacting, this class of engine is particularly suitable, and is still doing efficient service.

The new Iowa Central locomotives have single-expansion cylinders. The steam distribution is controlled by balanced slide valves, which are driven by the Walschaerts motion. The cylinder castings are of the usual design, except that the steam chest center lines are placed 2½ inches outside the cylinder center lines. In addition to the usual cylinder cocks, a third cock is placed on each side for the purpose of draining the live steam passages.

The location of the steam chests and the spacing of the wheels on these locomotives make possible a simple arrangement of valve motion with all moving parts in practically one plane. The link bearings are bolted to the guide yoke, which also supports the reverse shaft bearings. The valve rods are

coupled directly to the combining levers, and are supported by suitable bearings which are bolted to the top guide bars. Cast steel links and return cranks are used. The valves have a maximum travel of 5½ in., and 3/16 in. constant lead.

The guides are of hammered iron, case-hardened, and the guide yoke is also of hammered iron. It is made in three pieces, the bearers for the bottom guide bars being securely bolted to the yoke proper. This form of construction has been used on a number of heavy locomotives recently built by the Baldwin Locomotive Works.

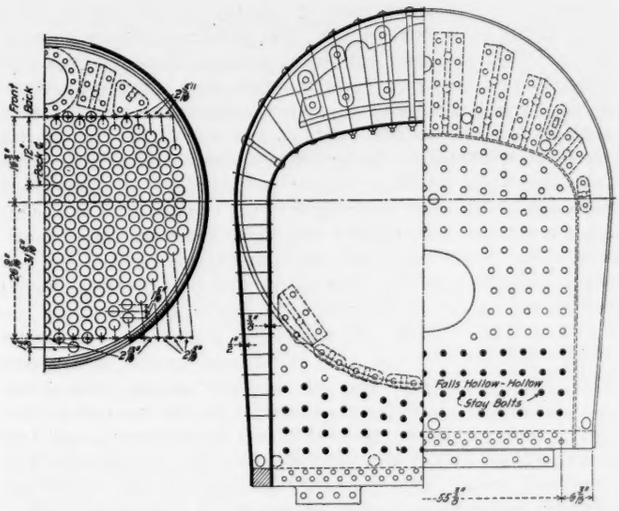


Crown Head Bolt.

As is usual in locomotives of this type the first pair of driving wheels is equalized with the leading truck, while the loads on the main and rear driving wheels are separately equalized. The truck is equipped with "Standard" forged steel wheels, with rims three inches thick. Cast steel is used for the truck frame, main engine frames, driving wheel centers, driving boxes and crossheads.

The boiler is of the wagon-top type, with a wide firebox having a vertical throat sheet and back head. The shell construction presents no peculiar features, but the arrangement of the tubes is somewhat unusual. The tubes are arranged in vertical rows, and the horizontal spacing is uniformly increased from the top to the bottom. The same spacing is used in both the front and back tube sheets.

The firebox is radially stayed, with two ⊥ irons supporting the front end of the crown. Baldwin standard crown head bolts, a detail drawing of which is shown, are used in staying the crown sheet. The side water legs slope outward slightly as they rise. The mud ring is a steel casting, double riveted to the firebox shell, and supported on sliding shoes in front and a buckle plate at the rear. The shoes bear on a steel cross-tie which forms a substantial frame brace under the front end of the firebox. In the staying of the firebox there is a departure from the current practice in the total absence of all flexible staybolts. At the bottom of the box, however, the four lower rows are Falls hollow bolts.



Section and Elevations of Firebox and Front Tube Sheet.

The tender frame is built of 13-in. steel channels, the trucks, of the arch-bar type, have cast steel bolsters and double elliptic springs. The tank is U-shaped, with a sloping floor and fuel space.

The following are some of the principal dimensions of these engines:

Cylinder diameter	20 in.
Piston, stroke	28 "
Boiler, diameter	64 "
Boiler, thickness of sheets	5/8, 11/16 and 3/4 "
Steam pressure	200 lbs.
Firebox, length	96 in.
" width	60 "
" depth, front	71 "
" depth, back	61½ "
" thickness, sides, crown, and back	5/8-in.
" thickness, tubesheet	½-in.
" water space, front	4 in.
" water space, sides and back	3½ "
Tubes, material	Steel
" thickness	No. 11
" number	318
" diameter	2 in.
" length	12 ft. 3 "
Heating surface, firebox	153 sq. ft.
" " tubes	2,026 "
" " total	2,179 "
Grate area	40 "
Wheels, diameter, driving	57 in.
" " truck	30 "
" " tender	33 "
Journals, driving	9 in. x 12 "
" truck	6 " x 10 "
" tender	5 " x 9 "
Wheel base, driving	14 ft. 6 in.
" " total engine	23 " 0 "
" " engine and tender	50 " 0 "
Weight on drivers	128,900 lbs.
" " truck	26,300 "
" total	155,200 "
" engine and tender	265,000 "
Tank capacity, water	5,500 gals.
Tank capacity, coal	9 tons
Tractive effort	33,400 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 3.86$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 4.64$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 83.03^*$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 873.76$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 54.47$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 7.02^*$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 59.11$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 71.22$$

$$\text{Displacement, 2 cylinders, cu. ft.} = 10.18$$

$$\frac{\text{Heating surface}}{\text{Displacement, 2 cylinders}} = 214.04$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 3.92$$

*Per cent.

THE CANADIAN RAILWAY COMMISSION.

FROM A CORRESPONDENT.

The utility of the Railway Commission of Canada is emphasized by the increasing volume of work, and which is necessitating the appointment of three extra members. These are Mr. S. J. McLean, professor of economics and transportation at the University of Toronto; Mayor D'Arcy Scott, of Ottawa, who for many years has been solicitor for the Canadian Pacific Railway at Ottawa, and the other member is Hon. Thomas Greenway, former Premier of Manitoba. It was Prof. McLean who drafted the railway act creating the commission and defining its duties. These appointments will greatly strengthen the commission. Mr. Scott will be assistant chairman.

Last year (year ending June 30), the number of applications

to the board and its general business increased by 35 per cent. in comparison with the preceding 12 months. The board heard argument in over 500 cases. There is always a number which, though entered for hearing, are settled by private conference between the parties in interest, or referred to one of the board s experts, whose report usually settles the matter. A great many crossing cases came before the board, but these are more easily dealt with. The complicated questions, and there have been many during the past year, concern mainly those of freight rates. There have not been many complaints with respect to passenger tariffs. Telegraph, telephone and express companies now come within the jurisdiction of the board. The new chairman, Judge Maybee, has made good in his position. His most noteworthy characteristic is his facility in dealing with cases and an ability to quickly get at the kernel of a matter in dispute.

Prof. McLean was born and educated near Ottawa. He is a graduate of the University of Toronto and is about 38 years of age. He has published a large number of studies dealing with transportation, and in 1898-1901 was engaged in an advisory capacity by the Department of Railways of Canada. In 1904 and 1905 he acted as an expert agent of the United States Bureau of the Census, and of the Interstate Commerce Commission.

THE BEGINNINGS OF TRACK-CIRCUIT SIGNALING.*

On August 20, 1872, there were issued to William Robinson United States Letters Patent No. 130,661, covering the "closed-track circuit" which forms the basis of all modern systems of automatic block signaling. This invention, simple as it seems to-day, was in reality a wonderful achievement since it involved the conception of the possibility and ultimate practicability of economically energizing a distant electro-magnet by means of a feeble electric current transmitted for a considerable distance through one grounded conductor, through the coils of an electro-magnet, and the return of this electric current through another grounded conductor parallel with the first and distant from it less than five feet; these two grounded conductors being the two running rails of a railway track; and it further involved the conception of the possibility and practicability of having each pair of wheels of a train afford, in combination with the track circuit, the means for making and breaking a signal circuit as required.

Robinson made a number of small installations of his system in various parts of the country, and among others, one at Irvineton and another at Ridgeway, Pa., on the Philadelphia & Erie Railroad, both of which, fortunately for the future of automatic signaling, were inspected on October 24, 1873, by a party of Pennsylvania Railroad officials, among whom were A. J. Cassatt, Frank Thomson and Robert Pitcairn.

In 1875 there was installed at Newark Junction, on the New York division of the Pennsylvania Railroad, an interlocking machine, purchased, with all its signals and connections, from Saxby & Farmer, of London, which company later exhibited their interlocking and other signaling devices at the Centennial Exhibition in Philadelphia—all of which were examined with great intelligence and appreciation by the above named and other officers of the Pennsylvania Railroad, with the result that through their representations, a group of capitalists became interested in the subject of signaling and in 1882 organized a company to exploit the Saxby & Farmer and Robinson inventions. The first large installations of automatic signals were made by this company in 1884; 434 of the "clock-work" discs and 65 "electro-pneumatic" semaphores having been put in service that year.

The Robinson "closed-track circuit" patent expired August 20, 1889, up to which time there had been installed 811 "clock-work" discs and 110 "electro-pneumatic" semaphore signals, a total of 921 automatic signals. In view of the great merit of the Robinson invention and of the further fact that practically every important principle now employed in automatic signaling was known years before the expiration of the Robinson patent, it may now seem surprising that during the 17 years of life of that patent it should have been so little used. For example, Spang had, as early as 1873, disclosed the means for providing, in combination with the Robinson invention, a polarized, wireless, distant signal circuit; Pope had patented the identical scheme, which almost a generation later, was again patented, for placing home and distant signal-control relays of widely different resistances, in series, and having the home signal, when at "proceed" cut in a low resistance "holding" coil, thus allowing the distant-control relay to be energized; the Gassett overlap and the Robinson "relayed track circuits" had both been used; Gassett had further patented the identical means, which many years afterwards were again patented and have been largely exploited, for converting a "normal clear" into a "normal danger" system.

But, while the above and many other principles now largely used in automatic block signaling, were well known in the art long before the expiration of the Robinson patent, it should be remembered that until the expiration of that patent there was lacking the one element most essential to its successful development, and that element was "competition."

The Robinson "closed-track circuit" being basic and fundamentally indispensable in any system of automatic block signaling and no satisfactory or adequate equivalent or substitute having been found, it was impossible that there should be any real competition until this controlling patent had expired and means had been found for successfully avoiding infringement of other minor but important patented features of track circuit block signaling—such as the "Gassett overlap." Such means were found about 1892 and thereafter track circuit control, which had theretofore been beautiful in theory but very unsatisfactory in practice, was rapidly improved. The old buttonhead rivet track wires gave way to the channel pin; cheap forms of track batteries having high internal resistance were replaced by low resistance cells of much larger current discharging capacity; upon the advent of the Weber insulated joint the wooden splice bars and fiber insulated iron bars were relegated to the scrap heap or placed on side tracks; long runs of No. 14 B. & S. wire between rails and battery or relay, or about switches and crossings, were shortened as much as possible and wires of suitable gage were employed; small, delicately adjusted, high resistance relays gave way to others that were larger, better built, of low resistance, and of relatively high efficiency; better battery and relay housings were furnished—and, in short, under the stimulus of competition, each and every detail entering into the construction of a track circuit section, was rapidly improved. Similar improvement was made in the signal mechanisms themselves and the railways, quick to appreciate the advantages of a practical, usable, automatic, block system, began to order it, chiefly for use on their busiest lines. By the end of 1899 there were in use 1,055 "clock-work" discs, 2,263 "electro-pneumatic" semaphores, 2,974 "enclosed discs," and 204 "electric" semaphores, a total of 6,496 automatic signals, as against 921 at the end of 1889. Five years later, at the end of 1904, there were in use 1,165 "clock-work" discs, 6,000 "electro-pneumatic" semaphores, 4,697 "enclosed discs," 6,933 "electric" semaphores, and 1,934 "electro-gas" semaphores, a total of 20,729.

While figures are not available to show the exact number of automatic signals installed in 1905, 1906 and 1907, it is known that within that period, while there has been a small decrease in the number of "clock-work" disc signals employed and only a small increase in the number of "enclosed disc," "electro-pneumatic" and "electro-gas" semaphores, there has been an enormous increase in the number of "electric" semaphores, more signals of this type having been sold in these three years than were installed of all types in the prior 25 years.

*From a recent catalogue of the General Railway Signal Company.

General News Section.

The Philadelphia & West Chester Traction Co. last week had three conductors arrested for misappropriating fares—instead of merely requesting their resignations on the ground that their accounts were not satisfactory.

The Kansas Railroad Commissioners have asked the Missouri Pacific to put the tracks of the road in Kansas in repair; unless the repairs are made, the Board proposes to send inspectors out on all the lines and to publish weekly reports of their condition.

The Railroad Commission of Indiana has issued a call for a conference to be held at its offices on November 10 for the discussion of methods of preventing railroad accidents. Division superintendents and other operating officers of railroads and also not more than two trainmen for each 200 miles of railroad in the state are invited.

A report has been published that the New York tunnel extension of the Pennsylvania would be opened for traffic in the spring of 1909, but it is not true. The tunnels will be completed this coming winter, but at least a year will be required for laying the tracks and installing electric apparatus and completing the New York station building.

Newspaper reports that the Chicago, Milwaukee & St. Paul intends to take over all of the express business on its lines are incorrect. The St. Paul will handle all the express business on its Pacific coast extension through the Continental Express Company, which it owns. The contract for handling express business on the rest of the system is held by the United States Express Company, and an officer of the road says that there is no intention of making any change.

At Pittsburgh last week three men were arrested for selling tickets over the Pennsylvania which had been "raised." It is said that these men defrauded the road by buying tickets in which the destination was filled out in ink, and then altered them to read to a destination many miles farther away than that originally written on the ticket. They avoided detection by having the passenger leave the train at a point short of the destination, and before his ticket had been taken up by the conductor.

The State Railroad Commission of Nevada has issued its first annual report. The commission was appointed March 25, 1907, but when the railroads were notified to make their tariffs for freight and passengers conform to the rates provided by law, injunctions were obtained by all of the roads in the state, except one, and practically no progress has been made. The report consists mostly of an account of the proceedings in the courts on these suits, begun by the railroads, to test the authority of the state to thus regulate their rates.

L. C. Fritch, Assistant to the President of the Illinois Central, who spent a week in New York conferring with officers of the New York Central, the New Haven and other roads regarding the results of electrification of their lines, said on his return to Chicago that a long investigation probably would be necessary before the officers of the Illinois Central could decide what system to use in the electrification of their suburban tracks in Chicago. He said that owing to the wide differences of opinion existing among officers of roads that had been electrified it would be very difficult to decide what system was best. Mr. Fritch will return to New York soon to make a further investigation.

The Corporaion Commission of Oklahoma has issued an order for each railroad in that state to give it the following information: An alphabetical list of all its stations in the state at or near which its line crosses, intersects or has physical connection with the line of another road; what roads it intersects, crosses or has physical connection with; the distance to the nearest tenth of a mile that each intersection is north or east of each station; the distance to the nearest tenth of a mile that each intersection is south or west of each station; whether the crossing or intersection is at grade, overhead or underneath; if a crossing is at grade and is on a fill, the depth of the fill in feet; if there is actual physical connection, the distance to the nearest tenth of a mile that the head block of the switch of such connection is north or east of such intersection or south or west of such intersection. Any company unable to file this report before October 5 must file with the Commission a statement on or before October 1 why the information cannot be furnished and when it will be furnished.

George Washington as a German.

The North German Lloyd steamship George Washington is to be launched at Bremen Oct. 31. This vessel will be the largest German steamer in the world, being 777 ft. long, with a tonnage of 27,000.

For an Advance in Freight Rates.

Alfred H. Mulliken, President of Pettibone, Mulliken & Co., Chicago, has published a small pamphlet entitled "The Advance in Freight Rates," in which he urges business men to do all in their power to bring about an advance in freight rates, and replies to the arguments of O. C. Barber, President of the Diamond Match Co.

Bequests to the M. C. B. & M. M. Associations.

There was probated on September 29 the will of Mrs. Luther G. Tillotson, containing bequests of $5,000 each to several associations, among them the American Railway Master Mechanics' Association and the Master Car Builders' Association. Mrs. Tillotson's bequest, undoubtedly made at the request of L. G. Tillotson, who died in 1885, recalls the memory of a fine type of railroad supply man. Tillotson's father was a pioneer builder of telegraph lines and the son became a telegraph operator in the service of the Erie Railroad. His name was known, and well-known, for many years and associated with that of General E. S. Greeley as dealers in railroad and electrical supplies in Dey street, New York.

Wisconsin Eight-Hour Law Declared Void.

According to a press despatch from Madison, Wis., Sept. 29, the supreme court of Wisconsin has declared unconstitutional the eight-hour railroad telegraphers' law which was enacted at the 1907 session of the Legislature. The law is declared invalid on the ground that it is in conflict with the provisions of the Federal constitution, which clothe Congress with the power to regulate interstate commerce; and further that, Congress having already provided a law fixing the hours of railroad telegraphers from 9 to 13 hours, it is not within the power of the state to enact a law which would in effect change these hours of labor. A similar case, in Arkansas, was decided in the same way, on September 24, by Judge Coffin in the Circuit Court at Newport.

Disastrous Collision in Montana.

On the Northern Pacific Railroad near Young's Point, Mont., September 25, a butting collision between an eastbound passenger train and a westbound freight resulted in the telescoping of the smoking car of the passenger train by the car ahead of it, and the death of 18 of its occupants, all apparently passengers. About 20 passengers were injured. No persons were seriously injured in the other cars. The passenger train was traveling at high speed, the grade of the road being descending; and, in consequence of a snow storm which was prevailing at the time, or some other reason, the engineman

did not see the flagman, who had been sent out by the freight, in season to reduce his speed. The freight had been unable to make time on the ascending grade because of the snow, and had sent a flagman ahead.

Meeting of Supply Manufacturers.

An important meeting of the manufacturers of railroad materials and equipment was held at the Waldorf-Astoria, New York City, Sept. 30, to co-operate in associated effort for conservation of the interests of the railroads. George A. Post, President of the Standard Coupler Company, New York, as temporary chairman of the meeting, delivered the following address:

This assemblage represents a vast amount of invested capital, to which a great army of American artisans look for remunerative employment. Whether the capital so invested shall yield profitable returns to the investors who venture their money therein, and whether the labor of workingmen shall be in demand in our plants so that full wages may be earned by them, depends entirely upon the measure of prosperity enjoyed by our railroads.

We all know too well what the conditions have been for long months past. Locomotives and cars have been idle by the thousands, and railroad earnings have shrunken to an appalling degree. There has ensued a shutting down of shops, throwing out of employment an army of mechanics; laying off of train crews and other employees, and almost an absolute cessation of the purchase of materials. This has had its disastrous reflex, of course, in our operations, and the ramifications of distress have been widespread.

When railroads are prosperous, times are good everywhere; when railroads are not prosperous, jobless hordes are in despair, and the cupboards of workingmen are bare. Largely responsible for this paralysis afflicting our railroads is the attitude of harsh hostility toward them, as manifested in federal and state administrative and legislative circles. Because of this hostility, confidence of investors in their prospective profitable operations, and in the stability of values of their securities has been seriously undermined.

To denounce railroads and railroad officers, and to scheme for their discomfiture, has become epidemic among many people otherwise rational. So persistent has been the indiscriminate condemnation of railroad managers, that it has come to be considered a necessary ingredient of the vocal output of those who seek popular favor to gain political preferment. In the absence of any other qualification for the exercise of political power, the aspirant has deemed it sufficient to declaim vehemently against railroads and to give assurance that condign punishment shall be meted out by him, if elected, to those who control the means of transportation. No legislative anti-corporation bomb could be too deadly to please people who are frenzied in their opposition thereto. To doubt the wisdom of any weird, bungling, or ill-considered legislative panacea offered by economic quacks as a cure for all ills incident to railroad operations, is to be instantly placed in the pillory of inflamed public opinion. The suggestion that the courts might pronounce unconstitutional a proposed law in the alleged interests of the people and against the railroads in deference to legal principles established by the judicial deliverances of the purest, most profound and fair-minded jurists of our land from the foundation of our government, is only provocative of sneers at the courts, and ribald denunciation of them. To malign judges for any decision rendered contrary to the desires of furious and erratic politicians, has become as common as the scoldings of the proverbial fishwomen.

To attain the knowledge and experience wherewith properly and successfully to operate a railroad is a tedious process. The preliminary training covers many years of patient toil and profound study of the subject, and is then only possible of attainment by those of a high order of intelligence. And yet, it has come to pass in this era of hysteria that such men and their views regarding railroad operations are tabooed. The popular conception of the true railroad scientist is one who never spent a day of his life in railroad service, but whose mental activities have been applied in other occupations far removed from the possibility of acquiring railroad knowledge. It is a peculiar fact that a trained railroad man will frankly disavow any knowledge of how to conduct any other business, but you seldom find a man running any other kind of business, whether successfully or otherwise, who does not consider himself a competent critic of railroad management.

The railroads of America are just now the victims of a powerful and vindictive wrath trust. We hear much of the depredations of trust magnates, and the injustice and oppressions of predatory wealth. But what of the devastating attacks of "predatory wrath" upon the railroads? There has been an amalgamation of all the small local hostilities to railroads that have been started—here through the peevishness of some station agent, there through the brusque manners of an uncivil train man, elsewhere by the avarice of some wicked stock jobber, or, in some quarters, by the frosty pomposity of some railroad executive. These wrath factories have poisoned the minds of whole communities, and sharp-tongued representatives have enlisted the antagonism of counties. Ignited by the fiery objurgation of excited orators, states have become mammoth furnaces wherein discontent has seethed, hissed and blazed. From these fires of wrath, sparks in the shape of ambitious, cunning self-seekers have been shot into the municipal, county, state and federal councils, there to set fire to the imagination, the hopes, the fears, and cupidity of the populace, and to hurl fire-brands of inimical legislation into the camps of the railroads. Onward has spread the work of consolidation. To those agitators engaged in promoting the wrath trust, it has been found to be a business that paid them well. Lucrative jobs have dangled as prizes before their eyes. Before them were official plums to be had as the reward for making much noise, suggesting new kinds of thumb-screws for application to railroads, advocating straitjackets for alleged railroad criminals, and shouting for blighting reductions in transportation rates, while at the same time indulging in loud-lunged demands for constantly increasing rates of wages to show their fervent love for the railroad employee. Meantime, of course, all these machinations were calculated to deprive said employee of his job entirely, only the poor fellow didn't seem to understand it until the blow struck him.

It has been a great, fat feast for predatory wrath makers. They have roamed abroad throughout the land, putting crimps in railroads that make them writhe in the agonies of depleted revenues and that have emptied the dinner pails of an army of railroad employees.

No trust that was ever organized in this country has it in its power to create the thousandth part of the havoc, rob so many people of employment, strike terror to the hearts of investors and diminish the incomes of widows and orphans as has this same juggernaut of agitation—the wrath trust.

Its vengeful progress must be checked. The hour has struck when courageous men must form a wall of human adamant and resist it. If ever again good times shall return to bless us; if ever again we may boast of American prosperity; if ever again confidence shall be restored in business circles, there must be an end to this frenzied fulmination against railroads, and calm reason must bear sway in the solution of the intricate problems that confront us. Scowls and clenched fists fetter reason. Smiles and the friendly handshake set it free.

No difference of opinion between men or conflicting interests was ever settled satisfactorily while the disputants screamed at each other with flushed faces and assumed an attitude of physical menace. Somebody may be "licked" as the result of an angry dispute, but that does not settle anything. The conqueror in the melee may swagger in token of his superior muscular prowess, but the vanquished one is convinced of nothing except his wounds, contemplation of which makes him morose and dangerous. Not by hurrah and threats, but by peaceful conference and honest argument is it possible to arrive at satisfactory settlements.

Gentlemen, you have been called together that we may counsel with one another to ascertain what we may do to aid in bringing about a better condition of affairs. If by any means that we may devise there can be secured an abatement of the rancor that now characterizes discussions of questions involving railroad matters, such consummation will be worth all the time and energy necessary for its attainment. We cannot be better employed. At this critical juncture, our railroads need friends.

In any dispute the right is seldom all on one side. All the zeal for gain and commercial advantage in this country is not confined to those who manage our railroads. Every shipper is not a saint, nor is every common carrier a demon. Not every complaint lodged against a railroad is founded in truth and equity. A large percentage of the hue and cry against railroads is simply the vaporings of chronic growlers, who growl at railroads as they growl at their neighbors, or find fault with their family's expenditures.

It is true beyond a doubt that there have been in the past and are at present many things in the conduct of our railroads that were not and are not right, and against which protest has been and may be rightly made. To deny this would be silly, and would render abortive at their inception any efforts that we might make in behalf of railroads. If we would be influential in our friendship for the railroads, our attitude must not be that of condonation of any wrong, but staunch advocacy of fair play all round. We are manufacturers of railroad materials, not vendors of taffy.

There is serious work to be done. We want orders. We want to see the fires lighted in our furnaces, profits flowing into our coffers, workingmen made glad by the joyous sound of the shop whistles calling them from idleness to work. Not one of these hopes can be realized until railroads are relieved of the incubus of hostile agitation that now halts their successful operation.

It is admitted that some reforms are necessary and desirable in the conduct of railroads, to the end that discontent may be quieted. It is conceded that as public servants, exercising the great powers conferred upon them by the people, intended for the public good, and possessed of franchises of untold value, granted them by legislation, railroads should be subjected to proper regulation and supervision by the people through constituted authority. But there is a vast difference between healthful, sane regulation and vicious strangulation. Not every carping critic is a Solomon; nor is every lawmaker a statesman. Because a law is aimed at a railroad does not necessarily make it right or expedient; it may be wrong and work injustice. Hot-headed legislators enact hot-headed legislation. Statutes conceived in wrath have their fruition in paralyzed commerce. As abaters of the smoke nuisance they have our inventors in that line lashed to the mast.

The fevered brows of anti-railroad agitators need the application of the ice-bag of conservatism. It is of the utmost importance that there should be a reduction of the mental temperature wherein railroad questions are discussed. Everybody has been too hot. It is time to cool off.

What can we do to conserve the interests of the railroads? In the first place, it seems to be important that we should organize for united, persistent and intelligent action. In organization there is strength and dignity. What is everybody's business is nobody's business. Sporadic individual action counts for little. Already the railroad employees have started an organization which promises to do effective work in educating the rank and file along the lines of self-protection. When the time comes that every railroad employee understands and acts upon the understanding that his fortunes are absolutely linked with those of the railroads; that injuries to railroads injure him, and that his job and the comfort of his family depend upon the prosperity of the railroads, there will have been installed in the country a refrigerating plant of gigantic proportions, which will visibly cool the ardor of many red-hot spouters. So, also, if we can show to our employees that they can have work only when railroads are prosperous and have the money to buy things, they will turn deaf ears to the frantic exhortations of those who howl with insensate rage against the railroads.

Recently there has been circulated by some prominent manufacturers of railroad materials in Chicago some pamphlets containing nuggets of fact and persuasive figures for the information of their factory operatives that were splendid. These gentlemen are entitled to great credit for their conception of the idea and for the good that such publications will do. How much wider scope is possible for an organization supported by the contributions of several hundred manufacturing corporations and firms? Generous and progressive as was the work of these Chicago gentlemen, it is not fair that they should cary the burden unaided.

There are great possibilities for us to achieve valuable results in ways too numerous to mention at this time, and which time and experience in the work only would suggest. It does seem that a field of endeavor so inviting should be occupied. It does seem that an organization of our industry, co-operating with others, that shall avoid the pitfall of participation in partisan politics, and hew to the line of honest, earnest effort to secure for and from the railroads rational and straightforward consideration of questions affecting both the public and the railroads, could and would be a mighty force for the general welfare. Surely a trial of our ability to help cope with the evils that oppress us should be made.

The thoroughly trained, capable and honest officials, whose energies and brains are concentrated upon the problem of conducting the business of railroads profitably to their owners and satisfactorily to their patrons, should be upheld and their work appreciated. They are, in fact, the overwhelming majority.

Those railroad officials who vex the public by temperamental failings, who are brusque and inconsiderate in their intercourse with the public, must be brought to realize that they are in fact public servants and not monarchs.

Those who may be guilty of wicked practices, in the administration of railroad properties, should be scourged with the lash of universal scorn and driven from the railroad field.

Those who decry railroads with malicious intent; who would cripple them to gratify personal spleen, or for personal aggrandizement, must be exposed and their power for evil destroyed.

Those who criticize railroad methods intelligently; who have just cause for complaint in their dealings with railroads, must be accorded respectful audience and be listened to with ears anxious for the truth.

Those who depend upon railroads for subsistence, directly or indirectly, must be loyal to their means of support, and quick to resent interference therewith by crafty or turbulent trouble makers.

Railroads must be operated with a fair margin of profit, else they cannot maintain efficiency in equipment, adequately meet increasing demands for terminal facilities and other betterments, nor can they pay good wages to their operatives. In other business enterprises, it is a maxim that prices include a profit. If there are no profits, there is bankruptcy. There is no reason why transportation rates should not be adjusted upon the same basis. In the latter case, it being a matter affecting the whole people, the adjustment must be made with the concurrence of public officials. Of what vital importance it is, therefore, that such officials should be men of fair minds, clear minds, and act in the light of knowledge.

All these things can be accomplished. They must be accomplished. Who are better equipped than bodies of men such as are here assembled, to aid in their accomplishment? Achievement awaits volunteer effort. Shall we enlist? Gentlemen, what is your pleasure?

Colonel H. G. Prout, Vice-President and General Manager of the Union Switch & Signal Company, Swissvale, Pa., made the following address:

I am deeply interested in what you have said, and would like to take the time of this company for five minutes to try to make plain some of the aspects which the project presents to my mind.

The project so eloquently suggested by the Chairman appeals to us in several ways:

It appeals to us as business men, responsible to our stockholders for whom we are able sometimes to earn dividends, and as employers responsible to those who work for us, for whom we are trying to provide steady work and good pay. And it appeals also to the simple consideration that if we want to hold our jobs, we must make money.

The project appeals to us as citizens of the Republic and as patriots. It has a national meaning. If it can be carried out with the results which I foresee, it will add to the wealth and happiness of the whole country. We who get our living from the railroads are interested in the buying power of the railroads. To many of us it means life or death. But the influence upon the nation of the buying powers of the railroads spreads out like circles on a smooth pond when you drop a stone in it, and the circles of that influence do not fade away until they have included every man, woman and child in the nation. I can think of no individual whose happiness and prosperity is independent of the prosperity of the rail-

roads, from the President of the nation down to the tramp who risks his life on the brake-beam. The critics and the enemies of the railroads have really the same interest that the friends of the railroads have. It is all the same in kind—it is only a question of degree.

So I am speaking quite within bounds in saying that the movement which we hope to inaugurate to-day is of national significance. It is not only essential to our own prosperity that the railroads should be able to buy things, but it is essential to the greatness and the glory and the wealth of the country that the railroads should be able to increase their facilities so as to adequately serve the interest of the country. Twenty years from now the population of this country will have increased to one hundred and twenty million souls. It will be a population of the greatest producing power and the greatest consuming power of any nation that has ever appeared on the earth. The most essential element in so quickly bringing about that wonderful result (and I speak carefully and in all seriousness) the most essential element is adequate internal transportation for the quick and safe and cheap movement of the people, and what is far more important, the quick and regular and cheap movement of the freight traffic which such a nation creates and demands. So, I repeat that the project which we hope to launch to-day is one of national interest.

If we are going to help to restore the purchasing power and the borrowing power of the railroads, we must first seek the causes of their decline. I dismiss, instantly, the talk of over-capitalization. I make the assertion that the railroads of the United States as they stand to-day in the aggregate are under-capitalized rather than over-capitalized. When any one talks to you of over-capitalization, tell him to prove it. The burden of the proof is with him.

Obviously the present situation of the railroad companies as to impaired net earnings and as to impaired credit is a situation which they share with all other industries in the country, excepting, fortunately, the farmers. Many of the causes of the situation are common to us all, but in the case of the railroads, there is a special and powerful cause which has been working through some decades of time to bring about the present situation, and which has worked with special energy within the last five years. I mean that influence which your Chairman has so fortunately named as predatory wrath, which quite recently has been focused in very high places. This volume of predatory wrath is to a great degree a product of neglect, of indifference, of arrogance on the side of the railroads, and of ignorance, of sentimentality, and of greed on the other side. We hear much of the greed of corporations. It is not a circumstance to the greed of the political demagogues. The corporation always has obligations to many people; it has great obligations to its workmen. Great sums of money are spent every year by the railroads and by industrial corporations in providing pensions for their working people and in that which has come to be known as welfare work. We all know this from our own experiences. We all know the policies of our own companies in this particular and most of us know the policies and the practice of the best railroads in the land. But the political demagogue has no obligation but his own selfish ends. He is always willing to spend the money of the nation to help the working man, but you never heard that he spent a cent of his own money to that end.

I have long held that the railroad officers almost without an exception are delinquent in their duty to their companies and to the nation in their indifference to public opinion and in their neglect of their opportunities to create a correct public opinion. A few railroad men have taken pains to inform the public as to the facts, but considering their opportunities, their knowledge and their ability, the railroad men have been singularly ineffective in directing the political and social opinions of their fellow citizens.

So, the talk of demagogues has gone undisputed until thousands, and perhaps millions, of our fellow citizens take it for granted that the railroad corporations are greedy, that railroads are over-capitalized, that railroad officers are corrupt, that railroad rates are too high, that railroad officers are indifferent to the interests of the people and the organizations that they serve. Our fellow citizens forget entirely the power, the intelligence, the courage and (it is not too great a word to use) the genius which the railroads have put into the building of this empire, and our fellow citizens forget that the grocer on the corner, the farmer on the fence, the editor in his office, the politician on the stump, has just the same qualities of greed and selfishness and rapacity and just the same qualities of sympathy, and kindness and devotion and self-sacrifice that the railroad man has. Our fellow citizens forget this, and they overlook the fact, too, that intellectually and morally the railroad officer will average uncommonly high, because he is the product of a rigorous course of natural selection. He is where he is because he can carry responsibility, and he carries responsibilites that call for moral energy as well as for intellectual power.

All these things have been forgotten until it comes about that some of the most important newspapers in the land baste the railroads whenever they get a chance, and even the daily newspapers that try to be fair and friendly speak a good word for the railroads only with an apology. So it has come about that the ministers of the land take it for granted that the railroads are corrupt and rapacious, and that the man on the street thinks that it is not only smart but commendable to beat a railroad when he can, and he abuses the railroad just as he smokes or eats, as a matter of course, without thought of the possibility of doing anything else. What wonder then that the national and state law-makers are tumbling over each other to catch the gale of popular predatory wrath? What wonder that wrath and ignorance have ripened into hostile legislation, and that the cost of transportation has risen, and that rates have fallen until the margin is so small that it is only by an enormous volume of production that the railroad can show any net gain? What wonder that the market value of railroad securities falls and that their borrowing power diminishes?

But when the politicians begin to suspect that there is a big and intelligent vote on the side of the railroads they will run to cover like prairie dogs. When the newspaper editors begin to suspect that their readers and their advertisers dislike ignorant and irresponsible criticism of the railroads, they will try to inform themselves; at any rate they will be more guarded in what they say. When the ministers and the magazine writers begin to suspect that the men who are on the railroads are kindly and honorable human beings and patriotic citizens, they will be prompt to shift their own views. In the long run, presidents, courts, legislators, the pulpit, the press, and even the law itself, must rest on the great common body of public opinion.

The work that an organization on the lines suggested by your Chairman may do, is to begin to create a correct public opinion; in our own shops, amongst our own workmen, in our offices, amongst our neighbors, and so broadening out, wherever the opportunity presents itself this can be done.

I shall not stop to suggest how that is to be done; I merely take the occasion to say that we can bring about great results in that way. Not very quick results, but sure, and possibly more quickly than we suspect.

Another object that may be achieved is to spread the idea of partnership between the railroads and those of us who serve the railroads. If it can be made plain that we have the power to help the railroads and the disposition to help them, a more correct attitude of mind will doubtless develop on both sides. You and I know how many times we have endured the arrogance, the technicality and the narrow-mindedness of railroad officers, and particularly of subordinate railroad officers. The display of these disagreeable qualities is unprofitable to both sides; it does not help to lower our prices or to better our deliveries. I can easily see how a strong, friendly and useful organization of men like ourselves, who not only sell to railroads but produce tonnage for railroads to carry and passenger movement for railroads to handle, I can easily see how such an organization will grow in power and in the respect in which it is held, to the ultimate and great good of both sides.

The organization which we now have in mind comes at a critical moment. The railroad companies are chastened—they will be glad to have help; and the working men also are chastened, and if I am not much mistaken, before next spring they will be in a mood even more receptive to correct ideas than their present mood. We ourselves have not escaped the chastening rod, and are much more disposed to devote some time and energy to other work than putting up prices than we were 18 months ago.

So I have tried to set forth very briefly some of the reasons why I feel quite sure that an organization such as is now proposed will be acceptable and successful, and why it will be entirely practicable to bring about the results that I have suggested and many others.

The following firms participated in the conference:

Adams & Westlake Co., Chicago, Ill.
Ajax Forge Co., Chicago, Ill.
American Balance Valve Co., Jersey Shore, Pa.
American Brake Shoe & Foundry Co., New York.
American Car & Equipment Co., Chicago, Ill.
American Locomotive Co., New York.
American Locomotive Sander Co., Philadelphia, Pa.
American Valve & Meter Co., Cincinnati, O.
Anglo-American Varnish Co., Newark, N. J.
The Ashton Valve Co., Boston, Mass.
Atha Steel Casting Co., Newark, N. J.
Baldwin Locomotive Works, Philadelphia, Pa.
Barney & Smith Car Co., Dayton, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bettendorf Axle Co., Davenport, Iowa.
Bliss Electric Car Lighting Co., Chicago, Ill.
S. F. Bowser & Co., Inc., Fort Wayne, Ind.
Buckeye Steel Castings Co., Columbus, O.
The Bucyrus Co., Cleveland, O.
Buda Foundry & Mfg. Co., Chicago, Ill.
Buffalo Brake Beam Co., New York.
Butler Drawbar Attachment Co., Cleveland, O.
Cardwell Mfg. Co., Chicago, Ill.
Chicago-Cleveland Car Roofing Co., Chicago, Ill.
Chicago Railway Equipment Co., Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Cleveland Frog & Crossing Co., Cleveland, O.
Commercial Acetylene Co., Chicago, Ill.
Commonwealth Steel Co., St. Louis, Mo.
Consolidated Car Heating Co., Albany, N. Y.
Cook's Standard Tool Co., Kalamazoo, Mich.
Damascus Brake Beam Co., Cleveland, O.
The John Davis Co., Chicago, Ill.
Dayton Mfg. Co., Dayton, O.
Dearborn Drug & Chemical Co., Chicago, Ill.
F. W. DeVoe & C. T. Reynolds Co., New York.
Joseph Dixon Crucible Co., Jersey City, N. J.
Dressel Railway Lamp Works, New York.
The G. Drouve Co., Bridgeport, Conn.
O. M. Edwards Co., Syracuse, N. Y.
Farlow Draft Gear Co., Baltimore, Md.
Flannery Bolt Co., Pittsburgh, Pa.
Flood & Conklin, Newark, N. J.
Franklin Railway Supply Co., Franklin, Pa.
Fuller Bros. & Co., New York.
Galena-Signal Oil Co., Franklin, Pa.
General Railway Signal Co., Rochester, N. Y.
Gold Car Heating & Lighting Co., New York.
Goodwin Car Co., New York.
Gould Coupler Co., New York.
Griffin Wheel Co., Chicago, Ill.
Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Ingersoll-Rand Drill Co., New York.
International Seal Co., New York.
Jenkins Bros., New York.
Kay & Ess Co., Dayton, O.
Kennicott Water Softener Co., Chicago, Ill.
Link Belt Co., Philadelphia, Pa.
Charles R. Long, Jr., Co., Louisville, Ky.
McConway & Torley Co., Pittsburgh, Pa.
Manning, Maxwell & Moore, New York.
Michigan Lubricator Co., Detroit, Mich.
Middletown Car Works, Middletown, Pa.
The W. H. Miner Co., Chicago, Ill.
Morden Frog & Crossing Works, Chicago, Ill.
Murphy Varnish Co., Newark, N. J.
Nathan Mfg. Co., New York.
National Dump Car Co., Chicago, Ill.
National Lock Washer Co., Newark, N. J.
National Malleable Castings Co., Cleveland, O.
New York Air Brake Co., New York.
Niles-Bement-Pond Co., New York.
Otto Gas Engine Works, Chicago, Ill.
The Pantasote Co., New York.
Pettibone-Mulliken Co., Chicago, Ill.
Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Pratt & Letchworth Co., Buffalo, N. Y.
The Protectus Co., Philadelphia, Pa.
Pyle-National Electric Headlight Co., Chicago, Ill.
Quincy-Manchester-Sargent Co., New York.
The Railroad Supply Co., Chicago, Ill.
The Railways Materials Co., Chicago, Ill.
Ralston Steel Car Co., Columbus, O.
Ramapo Iron Works, Hillburn, N. Y.
Rodger Ballast Car Co., Chicago, Ill.
Safety Car Heating & Lighting Co., New York.
William Sellers & Co., Inc., Philadelphia, Pa.
Charles A. Sherburne, Boston, Mass.
Sherwin-Williams Co., New York.
James B. Sipe & Co., Pittsburgh, Pa.
Standard Coupler Co., New York.
Standard Steel Car Co., Pittsburgh, Pa.
Storrs Mica Co., Owego, N. Y.
T. H. Symington Co., Baltimore, Md.
Transue & Williams Co., Alliance, O.
Union Switch & Signal Co., Swissvale, Pa.
U. S. Metal & Mfg. Co., New York.
Verona Tool Works, Pittsburgh, Pa.
Vulcan Iron Works Co., Toledo, O.
Ward Equipment Co., New York.
Watson-Stillman Co., New York.
Westinghouse Air Brake Co., Pittsburgh, Pa.
Westinghouse, Church, Kerr & Co., New York.
Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.
Wolfe Brush Co., Pittsburgh, Pa.
Worth Bros., Coatesville, Pa.
Wyckoff Pipe & Creosoting Co., New York.

Extension of Railroads in German Africa.

In May of this year the German Bundesrat and the Reichstag authorized a loan of $38,000,000 for the extension of the railroads in German protectorates of Africa. This sum is to be applied to the following lines:

	Miles.
East Africa.—Extension of the Usambara Railroad from Mombo to Pangani	28
Extension of the Morogoro Railroad to Tabora	434
Cameroon.—A road from Duala over Edea to Widimenge	222
Togo.—A road from Lome to Atakpami	109
Southwest Africa.—A branch road from Seeheim to Kalkfontein	114
Total	907

In addition, $4,800,000 has been appropriated for the purchase of shares of the East African Railroad Co., which means that the line from Dan-es-salam will be controlled by the government.

The status of German railroad enterprise in Africa is therefore as follows:

	Built and building.	Authorized by recent appropriations.	Total.
East Africa	210 miles.	462 miles.	672 miles.
Cameroon	99 "	222 "	321 "
Togo	102 "	109 "	211 "
Southwest Africa	878 "	114 "	992 "
Total	1,280 miles.	907 miles.	2,196 miles.

It is estimated that this total of about 2,200 miles will all be completed and in operation in from six to seven years.

Disastrous Collision on the Berlin Elevated.

A collision of passenger trains on the elevated railroad in Berlin, Germany, on Saturday afternoon, September 26, resulted in the death of 20 or more passengers, one car falling to the ground, about 36 feet. The work of rescuing the injured passengers was very difficult and slow. The despatches say that some of the passengers who leaped from the cars fell on the third rail and were killed by the electric shock. One of the trains ran into the other as the two approached a junction on converging tracks. One from Leipzigerplatz ran into one going from Bülowstrasse station to Mockern-Brücke. The driver of the train at fault is said to have run past a fixed signal set against him.

Railway Signal Association.

The annual meeting of this association will be held at the Willard Hotel, Washington, D. C., Tuesday, Wednesday and Thursday, October 13, 14 and 15. The order in which the principal subjects will be considered is as follows: Tuesday, electric interlocking; mechanical interlocking; storage battery. Wednesday, committee No. 1, signaling practice, and sub-committee of No. 1, standard design; automatic stops and cab signals; subjects and definitions. Thursday, automatic block signals; rubber-covered wire; manual block signals; election of officers.

The hours allotted for the sessions are: Tuesday, 10 to 1 and 2 to 5:30; Wednesday, 9 to 1; Thursday, 9 to 12:30.

The President of the association is A. H. Rudd, Pennsylvania Railroad, Philadelphia; Secretary, C. C. Rosenberg, Bethlehem, Pa. The Chairman of the Committee of Arrangements is F. P. Patenall, Baltimore & Ohio Railroad, Baltimore, Md.

Pennsylvania Track Prizes.

The prizes for maintaining track in the best condition during the past year, awarded by the Pennsylvania Railroad to Supervisors and Assistant Supervisors, amount to $5,400. The first prize, amounting to $800 for the Supervisor, and $400 for the Assistant, for maintaining the best section of track throughout the past year, went to C. M. Wisman, Supervisor, and J. D. Lovell, Assistant Supervisor, who have charge of the track between New Brunswick and Tullytown, N. J. Four premiums of $800 ($600 for the Supervisor and $200 for the Assistant) for the best line and surface on a main line superintendent's division between Jersey City and Pittsburgh and Philadelphia and Washington, went to H. L. Thomas and M. W. Clement, West Philadelphia to Paoli; J. A. Burchenal

and T. E. Lightfoot, Thompsontown to Granville; C. J. Leiper and W. W. Hubley, New Florence to George; George Goldie, Jr., and H. A. John, Jr., West Philadelphia to Wilmington. A special improvement premium of $1,000, $700 to the Supervisor, and $300 to the Assistant, for the greatest improvement made in the line and surface of a supervisor's section of track was awarded to G. C. Koons, Supervisor, and H. H. Garrigues, Assistant Supervisor, who have charge of the track between George, Pa., and Wilmerding. Among the methods used to learn the exact condition of line and surface was to place glasses of water on the sills of windows on each side of the special inspection car at the end of a running train. Every spill of water occurring on each Supervisor's section was carefully recorded as a demerit.

Traffic News.

The Rock Island has decided to require passengers to buy tickets before entering trains at all stations (where tickets are sold) in the states of Iowa, Missouri, Nebraska, Arkansas and Oklahoma.

The Railroad Commission of Mexico has ordered an increase in freight rates on coal and coke imported from other countries, with a view to stimulating the mining of coal at mines in Mexico, recently discovered.

The St. Louis & San Francisco has opened for freight business its new line between Baton Rouge, La., and Livonia. Livonia is at the junction of the Texas & Pacific. A boat is used to transfer cars from Baton Rouge to the west side of the Mississippi river.

The Retail Merchants' Association of Augusta, Ga., has appealed to the Interstate Commerce Commission to authorize the remission of all demurrage charges on freight cars at Augusta since the disastrous flood which recently caused such a serious suspension of business in that city.

Traffic through the tunnel under the Hudson river at New York city was materially increased last week, partly on account of fogs which delayed ferry boats, so that trains had to be lengthened from three cars to four cars; and in the rush hours they were run at three-minute intervals. About 300 trains are now run each way daily.

A press despatch from Montreal says that those shipowners who have been carrying grain from Fort William to that city during the past summer at five cents a bushel and less, have concluded that they are losing money; and they propose to raise the rate to seven cents a bushel. Already large shipments of grain have been sent from the Northwest to New York and Boston.

A special train which was run from Cleveland last week to the bankers' convention at Denver not only contained all of the conveniences afforded in the best express trains, but, in addition, had a woman's "club" car, with a piano; and to insure that all the passengers should get the utmost possible enjoyment out of the luxuries of the train, the bankers engaged a physician to accompany them.

Allison Mayfield, Chairman of the Railroad Commission of Texas, has had an analysis made of the reports of the railroads of Texas as to the free passes issued by them during the past year and during previous years, and he estimates that the state anti-pass law saved the railroads $5 a mile in the year ending with last June. As there are 13,000 miles of railroad in Texas the total saving is put at $65,000. This is about .065 per cent. of the gross earnings of the companies.

The weekly bulletin of changes in freight and passenger rates issued by the State Public Service Commission of New York, Second district, for the week ending Sept. 26, shows reductions in commutation ticket fares for school children on the Rochester & Eastern and Rochester & Sodus Bay; advances in round-trip passenger fares by the same companies; new stop-over regulations on the New York, New Haven & Hartford; regulations governing the redemption of tickets by the Pennsylvania; and the establishment, by the Erie, of new car service regulations which apply at all stations on that system.

Shippers of shoes have protested to the western roads against the rule adopted by the Western Classification Committee last June, requiring wooden cases in which boots and shoes are shipped to be nailed throughout with cement-coated nails. Where this rule, which becomes effective January 1, is disregarded one class higher is to be charged. Shippers say that in opening boxes nailed with cement-coated nails the boxes are destroyed and also that cement-coated nails cost more than ordinary nails. They contend that if they comply with the rule they should be given a reduction in rates. A conference between shippers and traffic officers was held at Chicago this week.

The application of the Baltimore & Ohio to have the Interstate Commerce Commission restrained from enforcing an order relative to coal car distribution was denied by the United States circuit court at Baltimore, September 23. In this decision the court followed the opinion rendered by the Federal court at Richmond a week before. The order which the commission proposed to issue required the road to include private cars and cars sent in by other railroad companies for fuel in making up the total number of cars to be allotted to the mines according to their respective capacities; and as this order was not in conflict with any of the decisions of the courts, the application to have it enjoined naturally was refused.

A special meeting of the Western Passenger Association will be held in Chicago on October 6, at which there will be a proposition to make no passenger fares of less than 2 cents a mile during the next year for any occasion whatever. Soon after the 2-cent fare laws were passed in western states most of the roads decided to maintain the legal state rate on everything, and this was done for about a year. Recently several lines have made reductions for political conventions, state fairs, etc., and in two cases a rate as low as 1 cent a mile has been made. Many passenger officers say that the reduced rates have not stimulated business. Where the 2-cent rate was maintained last summer for state fairs and the lower rate was made this year, it was found that the amount of business was as great on the higher as on the lower rate.

The Railroad Commission of Texas will have the support of the traffic representatives of a large number of commercial organizations in its proceeding before the Interstate Commerce Commission against the advance of freight rates to the southwest. Traffic representatives of the railroads have held conferences with the traffic managers of industrial concerns and commercial organizations to induce them to keep out of the contest, but the conferences have been fruitless. Among the commercial organizations represented at a recent meeting in St. Louis to formulate plans for carrying on the contest against an advance in rates were the following: Chicago Association of Commerce, Western Fruit Jobbers' Association of Omaha, St. Louis Fruit and Produce Exchange, Missouri Manufacturers' Association, Business Men's League of St. Louis, Merchants' Exchange of St. Louis, Fort Worth Freight Bureau.

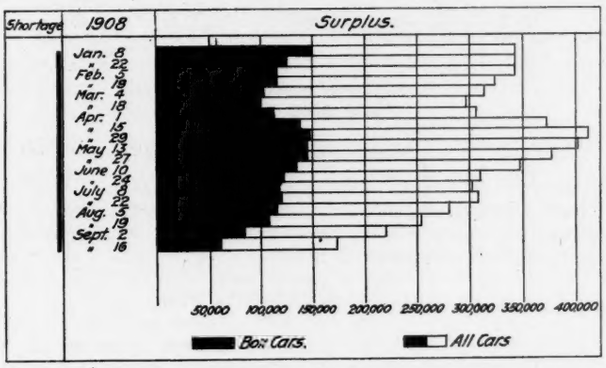
The newspapers have been printing long accounts of a case before the Interstate Commerce Commission concerning which there is at present no news whatever; and to explain these "news" items," Vice-President Thayer of the Pennsylvania Railroad, has made a statement in which he says: "The payment of 2 cents per 100 pounds, for transfer of sugar from refineries to cars, whether by drayage or otherwise, was made by the railroads both at Philadelphia and New York for many years prior to December 1, 1906. It was not a secret arrangement in any sense, being specified in the tariffs. Under the provisions of the amended law, which took effect on September 1, 1906, it became doubtful whether such payment could be legally continued. In view of this, the Pennsylvania, the Baltimore & Ohio and the Philadelphia & Reading to avoid any practice which might be doubtful, discontinued payment on December 1, 1906, both at New York and Philadelphia. Other lines at New York believing that there was nothing in the provisions of the new law to interfere, continued the payment. As a result, there is no doubt that since 1906 the Philadelphia refineries—in respect to the transfer payment—

have been at a disadvantage. Fully appreciating conditions, the Pennsylvania and other Philadelphia lines, on July 13, 1907, presented the question to the Interstate Commerce Commission, but up to this date the commission has rendered no decision.

Car Surpluses and Shortages.

In presenting bulletin 31-A, giving a summary of surpluses and shortages from October 30, 1907, to September 16, 1908, Arthur Hale, chairman of the Committee on Car Efficiency of the American Railway Association, says:

"There is a further decrease of 49,045 in the number of surplus cars, bringing the total down to 173,587. Of this decrease, 25,976 are box cars, and 18,356 coal and gondola. The improvement, although general, is most marked in groups 1 (New England), and 6 (Northwestern). In New England, the box car surplus has practically disappeared, while slight shortages have developed on some of the roads in this group. In the Northwest, the movement of grain has drawn into service practically all grain box available in that territory. The coal car situation in this district is also much improved, and there are few roads reporting an actual surplus of this class. A few roads have arranged to secure cars from eastern and southern lines still holding a surplus. In groups 2 (Eastern), and 3 (Middle), the box car surplus is gradually disappearing, and the number of coal and gondola cars remaining idle continues to decrease, although these groups still report considerable surpluses of this class."



Car Surpulses and Shortages in 1908.

The accompanying table shows the surpluses and shortages for the period covered by the bulletin and for preceding periods. The diagram shows the shortages for 1908.

CAR SURPLUSES AND SHORTAGES, FROM OCTOBER 30, 1907, TO SEPTEMBER 16, 1908, INCLUSIVE.

	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
September 16, 1908	163	58,668	12,200	66,891	35,828	173,587	2,252	104	311	268	2,935
September 2, 1908	160	84,644	12,970	85,247	39,771	222,632	928	108	355	27	1,418
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,622	90,757

Traffic Club of Chicago.

The first monthly luncheon of the Traffic Club of Chicago for the fall season will be given at the Grand Pacific hotel in Chicago, on Wednesday, October 7, at 12:30 o'clock. The entertainment committee has arranged to have luncheons throughout the winter on the first Tuesday of each month, but the first luncheon will be held on Wednesday because the speaker for the occasion could not be present on Tuesday. The address will be delivered by Hon. Joseph R. Ransdell, President of the National River and Harbor Congress, his subject being "Water Transportation." A number of guests in Chicago attending the Deep Waterway Convention, including prominent men from all parts of the country, are expected to be present.

General Passenger Agents' Association.

The fifty-third annual convention of the American Association of General Passenger and Ticket Agents was held at Toronto, beginning Sept. 22. About 250 members were present. President O. H. Taylor occupied the chair. Addresses of welcome were delivered by Hon. George P. Graham, Minister of Railways on behalf of the Dominion; Hon. J. J. Foy, provincial Attorney-General for the province of Ontario, and Mayor Oliver for the city of Toronto. Samuel Moody (Pennsylvania Lines) read a paper on two-cent fares, contending that few, if any, roads on this continent could afford to make reductions below that figure for special occasions. He pointed out that the railroads had raised the class of service by putting on vestibule cars and better equipments throughout, while State and other laws made the cost of operation heavier by new regulations such as that regarding smoke nuisances, elevated tracks, etc. He thought it was the general impression that two-cent fares had come to stay, and, this being the case, the roads should begin to educate the public that no less fare than two cents a mile can be made for delegate and organization meetings. When the railroads made a low fare to the National Republican convention at Chicago through business from commercial centers was light for a week before and after, showing that those who would otherwise have traveled at regular rates postponed or advanced their trips to take advantage of the cheap fare. In granting such fares the roads were discounting their regular business and educating the public to believe that a less fare than two cents a mile was profitable to them. At some of the political gatherings to which railroads made reduced fares the legislative candidates and other speakers vilified in every way possible the corporations, and especially the railroads. He further advocated the discontinuance of reduced fares for the Christmas, New Year, Fourth of July and other holidays. In the discussion which followed Charles S. Lee, General Passenger Agent of the Lehigh Valley, and Charles M. Burt, Boston & Maine, endorsed the views of Mr. Moody. In the evening a banquet was held, presided over by President W. K. George of the Canadian National Exhibition, at which speeches were made by President Taylor, N. E. Weeks, J. J. Byrne, Mayor Oliver and others.

The election of officers took place on the 23d, George T. Bell, General Passenger and Ticket Agent of the Grand Trunk, Montreal, being chosen President; S. G. Hatch, Illinois Central, Vice-President, and C. M. Burt, Boston & Maine, Boston, Secretary. Toledo, Ohio, was selected as the next meeting place. The question of recommending changes in the rules as to the age at which children shall be entitled to travel for half-fare was left over, as it was found that in several States the matter was regulated by law. In the afternoon the members were the guests of the Royal Canadian Yacht Club. Some of the members took a trip to Muskoka, Cobalt and Temiskaming.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Mexican Central has ordered one locomotive.

The Western of Havana is figuring on switch engines.

The Grand Trunk Pacific is figuring on 50 locomotives, both passenger and freight.

The Carolina, Clinchfield & Ohio, reported in the *Railroad Age Gazette* of September 11 as in the market for 25 100-ton consolidation (2-8-0) locomotives, has ordered four of them from the Baldwin Locomotive Works. It is expected that further orders will be placed soon.

General Dimensions.

Weight on drivers	180,000 lbs.
Total weight, engine	200,000 "
Total weight, engine and tender	340,000 "
Cylinders	22 in. x 32 in.
Diameter of drivers	57 "
Boiler, type	Radial stayed
" working steam pressure	190 lbs.
" heating surface	About 3,500 sq. ft.
Tubes, material	Seamless cold-drawn steel
Tubes, outside diameter	2¼ in.
Grate area	45 sq. ft.
Tank capacity	7,000 gals.
Coal capacity	12 tons

Special Equipment.

Air brakes	Westinghouse
Bell ringer	Sansom or Gollmar
Boiler lagging	Sectional magnesia
Bolsters	Simplex
Couplers	Top lift; 5-in. x 7 in. shank
Headlight	Pyle electric
Injectors	Monitor, No. 11
Sanding devices	Leach
Sight-feed lubricators	Nathan

CAR BUILDING.

The German-American Car Lines are building 100 8,000-gal. tank cars at their Warren, Ohio, shops.

The New York Central Lines have given a contract to the American Car & Foundry Co. for rebuilding about 5,000 freight cars.

The Oklahoma, Kansas & Missouri Interurban, F. O. Freeman, Secretary, Miami, Okla., is in the market for gasolene motor cars.

A. V. Kaiser & Co., Drexel building, Philadelphia, Pa., are in the market for 200 50-ton second-hand steel hopper bottom coal cars; also one second-hand private car.

The Central of Georgia, reported in the *Railroad Age Gazette* of Sept. 18 as being in the market for 16 passenger cars, has definitely decided not to purchase these cars.

The Chicago, Milwaukee & St. Paul has ordered underframes and trucks from the Bettendorf Axle Co. for 5,000 fifty-ton box cars which will be built in the Milwaukee shops of the railroad company.

The Isthmian Canal Commission has ordered 50 all-metal dump cars to the Wm. J. Oliver Manufacturing Co. The details of this equipment were published in the *Railroad Age Gazette* of August 14.

The Chicago, Burlington & Quincy has given an order to the Barney & Smith Car Co. for steel underframes for rebuilding the 10 baggage and 2 mail cars mentioned in the *Railroad Age Gazette* of September 4. These cars will be rebuilt in the Aurora, Ill., shops of the railroad company.

The Birmingham Southern is in the market for 150 50-ton hopper bottom cars. These cars are to weigh 41,000 lbs. and to be 32 ft. 7 in. long, 9 ft. 6 in. wide and 8 ft. 4½ in. high, inside measurements, and 35 ft. 1 in. long, 10 ft. 1⅜ in. wide and 10 ft. 8 in. high, over all. The bodies and under-frames are to be steel. The special equipment will include:

Axles	Open-hearth steel
Bolsters, truck	Reliance
Brakes	Westinghouse
Couplers	Major
Doors	Drop
Door fastenings	Open-hearth steel hinge
Draft gear	McCord, Type F
Journal boxes	McCord
Paint	Black
Trucks	Diamond arch-bar type

The Iowa Central, reported in the *Railroad Age Gazette* of August 21 as having ordered 250 40-ton all-wood gondola cars and 200 30-ton all-wood box cars from the Mt. Vernon Car Manufacturing Co., has ordered 12 cabooses from the same company and 50 50-ton all-steel side dump coal cars from the Pressed Steel Car Co. The gondola and box cars are for delivery on November 1, the cabooses on November 15 and the coal cars on December 1. The special equipment for all cars will include:

Axles	Steel
Bolsters, truck	Simplex
" body—gondola and box	Simplex
" " —coal cars	Pressed steel
Brake-shoes	Streeter, steel back
Couplers	Simplex
Journal bearings	Eureka Brass Mfg. Co.
Journal boxes	Symington
Roofs, box cars	Hutchins sectional
Side bearings, except cabooses	Susemihl
Trucks	Andrews
Brake-beams	Simplex
Center plate	Barber

IRON AND STEEL.

The Long Island is said to be in the market for 900 tons of rails. This item is not confirmed.

The Alabama, Tennessee & Northern is said to be in the market for 60-lb. rails for the extension from Aliceville, Ala., south to Cochrane, about 12 miles.

RAILROAD STRUCTURES.

Chicago.—The Chicago & North-Western is now asking prices on the construction of its passenger terminal building in Chicago. Only contractors that are in a position to handle such a large project were furnished specifications and bids are to be in by October 3. The structure is to be completed by the summer of 1910. A contract for the construction of the cement sidewalks has been let to George W. Jackson, Inc., Chicago. A description of this terminal was published in the *Railroad Age Gazette* of August 14.

Duluth, Minn.—An officer of the Duluth, Missabe & Northern writes regarding the reports that the City Council has requested this company to put up a new passenger station at West Duluth that no official action has been taken by the company regarding the matter.

Havre De Grace, Md.—See note in other column on collapse of Baltimore & Ohio bridge.

Keithsburg, Ill.—Bids have been asked by the Iowa Central for building a new bridge to cross the Mississippi river at Keithsburg. The present structure has been condemned. The plans call for the completion of the bridge by September 1, 1909. A roundhouse, coal chutes and turntable are also said to be included in the plans for improvements.

Norwalk, Ohio.—Plans for temporary repair shops for the Wheeling & Lake Erie, to replace those recently burned, are about completed and will be submitted to the receiver of the road for approval in the near future. The courts will then be asked for authority to proceed with the erection of the buildings. (Sept. 18, p. 977.)

San Bernardino, Cal.—An officer of the Atchison, Topeka & Santa Fe writes that this company will in a short time resume work on the reinforced concrete storehouse, work on which was stopped some time ago.

Springfield, Ohio.—The Cleveland, Cincinnati, Chicago & St. Louis, according to a statement credited to the Chief Engineer, will begin the construction of its new $100,000 passenger station next year. The details of the depot are now being completed by Henry J. Schlacks, Borden block, Chicago, and it is expected that bids will be asked on the construction work next spring. (Aug. 7, p. 690.)

Texarkana, Tex.—The plans for remodeling and enlarging the Union station at this point have been approved by the different railroads and the work of reconstruction will be begun as soon as the railroad commissions of Texas and Arkansas formally pass on the plans filed. The enlargement of the station is made necessary by the arrangement of the Cotton Belt to enter and use the Union station for passenger traffic.

WINDSOR, ARK.—The St. Louis & San Francisco expects to finish this year rebuilding with heavy steel the three Boston mountain viaducts, south of this place. Work is to be pushed as rapidly as possible and will cost approximately $125,000.

SIGNALING.

The Northern Pacific is to equip about 10 miles with three-position signals, moving in the upper quadrant. These signals are made by the Union Switch & Signal Co.

The Chicago & North-Western recently abandoned its swing drawbridge over the Chicago river, near the Wells Street Terminal, Chicago, and installed a new lift bridge 40 ft. south, and this necessitated extensive alterations in the electro-pneumatic interlocking plant. These changes were carried out by the railroad company's forces, and all were made under traffic in 24 hours. The machine is an 83 lever frame with 67 working levers. Electric detection is provided on main tracks.

Automatic Block Signals on the Chicago & North-Western.

The Chicago & North-Western will shortly install with its own forces 58 miles of Hall automatic disk signals, normal clear, on double-track between Boone, Iowa, and Maple River Junction. The blocks will be an average of two miles long. There will be home and distant signals on separate posts. Line circuits will be used throughout and the home signal circuits will be broken through circuit controllers on all switches. Each switch will be provided with an indicator. At all crossovers the switches will be connected together by pipe connections and siding switches will be pipe-connected with derails in the siding.

When this installation is completed there will remain between Chicago and Omaha only 60 miles of the company's main line not equipped with automatic block signals.

Upper Quadrant Two Position Signals on the Wisconsin Central.

The General Railway Signal Co. has just completed the installation of two mechanical interlocking plants with upper quadrant 90 deg. signals for the Wisconsin Central. One is at Duluth at the crossing of the Wisconsin Central and the Northern Pacific. It is a Saxby & Farmer machine, with 16 working levers and 4 spare spaces. At this point the N. P. has double track, and the W. C. single track. On the N. P. the distant signals are power operated, being the General Co.'s model 5. All distant signals stand normally at 45 degs. The N. P. distant signals control indication locks on the home signal levers, so that unless they are normal the latch cannot be lowered. The plant is equipped with detector and conflicting route locking. The locks act on the derail levers in such a way as to lock them normal when the home signal for a conflicting route is cleared and to keep them locked until the train has passed out of the interlocking limits. Track circuits are provided only between the home signals. Thus, if one of the N. P. home signals is cleared for a train, the derails on the W. C. are locked normal until the train has passed, and vice versa.

The second plant is located at Yellow River Siding, Wis., where the W. C. crosses the Stanley, Merrill & Phillips, both single track. The machine is Saxby & Farmer, 12-lever frame, all levers working. All signals are mechanical and the distant signals stand normally at 45 degs. Detector and conflicting route locking are provided as in the former case. Both these plants were installed in connection with the Wisconsin Central's extension to Duluth. The General Railway Signal Co. has also changed the signals at two other mechanical plants, at Donald, Wis., and Ladysmith, Wis., on the W. C., from lower to upper quadrant.

SUPPLY TRADE NOTES.

E. McCormack, Assistant Treasurer of the Railway Steel-Spring Co., New York, has been elected Treasurer.

The Isthmian Canal Commission, General Purchasing Officer, Washington, D. C., is asking bids up to October 19 on one rock crushing plant. Details are given in Circular No. 470.

The annual report of the Westinghouse Air-Brake Co., Pittsburgh, Pa., says that orders have been gradually increasing and that therefore the usual dividend, payable October 10, was declared.

George B. Maltby, 507 American Trust building, Cleveland, Ohio, has taken the agency in that territory for Falls hollow staybolt material made by the Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio.

G. C. Marsh, formerly Treasurer and Manager of the Contractors' Supply & Equipment Co., Chicago, has opened an office at 970 Old Colony building, Chicago, to deal in contractors' supplies and equipment.

W. M. Duane, Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, effective November 1. He is to become Vice-President and General Manager of the Walsh Construction Co., Davenport, Iowa.

J. A. Kinkead, who has been with the American Locomotive Co. at Schenectady, N. Y., has resigned to become Manager of Sales of The Parkesburg Iron Co., Parkesburg, Va. His office will be at 2601 Singer building, New York.

A semi-annual dividend of 1 per cent. on the common stock of the Railway Steel-Spring Co., New York, has been declared. The annual rate has been 4 per cent. There had been rumors that this semi-annual dividend would be entirely passed.

The Bettendorf Axle Company, of Davenport, Iowa, is making about 25 steel underframes per day on its order for 2,500 frames for the Chicago, Milwaukee & St. Paul. The Bettendorf company has now over half a million bolsters in service and reports increasing business in its one-piece car truck frame.

An American consul in Russia reports that a firm there which is doing business in concrete-making machinery and implements would like to receive catalogues, prices, terms, etc., from American manufacturers of such machines and implements. Inquiry No. 2660, Bureau of Manufacturers, Washington, D. C.

The Carlgen Brake & Coupling Co., Salt Lake City, Utah, has been incorporated, with $75,000 capital stock, to make automatic brakes and air-brake coupling devices, the patents on which are controlled by Knut W. Carlgen. The officers of the company are: President, Knut W. Carlgen; Vice-President, K. E. Carlgen; Secretary, Brigham Clegg; Treasurer, William P. Pratt; General Manager, Charles Carlgen.

An American consul in a European country reports that most of the power machinery installed in a new factory there was imported from the United States. He says it is proposed to build new ones in the district—one in particular to utilize the water power available—and that undoubtedly the orders for this machinery and motors can be secured by American manufacturers. Inquiry No. 2649, Bureau of Manufactures, Washington, D. C.

The Isthmian Canal Commission, General Purchasing Officer, Washington, D. C., is asking bids up to October 22, on one 15-ton locomotive crane, one oil tank, a number of pumps, one flue welder, drills, punches and similar tools, journal bearings, truck and other car springs, miscellaneous car material, sheet copper and brass, rivets, bolts, spikes, nuts, washers, screws, chains, steel cable, rerailing frogs, stevedore trucks, wrenches and other tools, pulleys, valves, wire, electric switches, etc., bridge lumber, ties, piles and other lumber. Circular No. 471.

T. M. May has been engaged as a representative of the Brady Brass Co., New York. Mr. May is a graduate of Oxford University, England, and is well known throughout the railroad trade. John W. Gannon, graduate of Yale, 1899S, and afterwards Engineer Maintenance of Way of the Atlanta & West Point, has also entered the service of the Brady Brass Co. Their address is the New York office of the company, 95 Liberty street. The demand for the company's products has been increasing, and during the last two weeks several orders have been taken for brasses and bearings for new rolling stock.

The Cleve-Mor Engineering & Construction Co., Cleveland, Ohio, has been organized to do a general consulting engineering, designing and construction business, making a specialty of public service properties. Francis B. Morgan, who has been identified for some years with interurban railway work, is President, and James Z. George, Associate Member of the American Society of Mechanical Engineers and of the American Institute of Electrical Engineers, is the Managing Engineer. Mr. George has been at the head of engineering and construction companies and has been in the electric railway lighting and power field for some years.

The Allis-Chalmers Co., Milwaukee, Wis., has recently received, among other orders from electric railroads for air brake equipment, one from the Omaha & Council Bluffs Street Railway for 14 straight air brake equipments, being the second order received from this company during the current year. The Denison & Sherman Traction Co., of Denison, Tex., has changed the brake equipment on all its cars in favor of the type manufactured by the Allis-Chalmers Co. The Northwestern Elevated, Chicago, and the Yonkers Street Railway, Yonkers, N. Y., have each ordered 20 equipments. Additional orders for motors, controllers, compressors, governors or complete air brake equipments have been received from 30 different traction companies.

The Glidden Varnish Co., Cleveland, Ohio, has just broken ground for its new administration building. The building is to be of Colonial architecture, of brick with white marble trimmings, 110 ft. long and 65 ft. deep, with elaborate columns across the front. It will be thoroughly fireproof. The first floor will be devoted entirely to the advertising, Jap-a-lac and general sales departments, telephone exchange and dining room, where lunch will be served to the employees. The second floor will contain the officers' and board rooms, legal, credit, cost accounting, purchasing and traffic departments. On the third floor will be the rest room, library and convention hall. Lavatories and shower baths for the use of the office force, which numbers about 100 people, will be in the basement. The building will cost about $90,000, and will be ready for occupancy about May 1, 1909, when the general offices will be removed from the Rockefeller building.

The Readjustment Committee of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has agreed to the Merchandise Creditors' plan, with slight modifications, under which the property is to be restored to the shareholders. This plan is not to be declared operative unless the entire $6,000,000 of cash subscriptions to the new assenting stock and also the assents of the bank creditors are in hand by October 27. The plan adopted is nearly the same, as far as adjustment of finances, as that announced last spring. The company is to be managed by a board of twelve directors, consisting of persons approved by the Re-adjustment Committee, there being representation on the Board of persons acceptable to the Merchandise Creditors' Committee. The Readjustment Committee is to appoint a proxy committee to serve for five years, the persons on it to be chosen after a conference with the Merchandise Creditors' Committee and principal stockholders.

TRADE PUBLICATIONS.

Packing Rings.—A leaflet of the H. W. Johns-Manville Co., New York, illustrates and describes the J.-M. air-brake cylinder packing expander rings.

Generating Sets.—Bulletin No. 4,617 of the General Electric Co., Schenectady, N. Y., gives a general description of direct-connected generating sets. This bulletin supersedes No. 4,399.

Manganese Steel Castings.—A leaflet issued by the American Brake Shoe & Foundry Co., Chicago Heights, Ill., contains a list of castings made by the company for use in mining, smelting, quarrying and chemical works.

Suction Conveyors.—Bulletin No. 1 of the Darley Engineering Co., Pittsburgh, Pa., describes the suction conveyor made by the company. Several pages are devoted to a number of questions which have been asked regarding these plants.

Passenger Cars.—A leaflet just issued by the Hicks Locomotive & Car Works, Chicago Heights, Ill., contains the general specifications of standard new passenger cars built by this company. Attached to the leaflet are half-tones from photographs of three different types of these cars, also an interior view of a passenger coach.

Car Movers.—A leaflet just issued by the Appleton Car Mover Co., Appleton, Wis., contains reproductions of photographs illustrating two methods of moving a freight car. In one instance, 12 men, one using a crowbar, are necessary to move the car; while in the other, by the use of an Atlas car mover, one man alone does the work.

Electric Cars.—Brill's Magazine for September 15, published by the J. G. Brill Co., Philadelphia, Pa., contains a description of the equipment recently built at the Brill plant in Philadelphia for the city and suburban lines of Washington, D. C.; also an article describing the large semi-convertible interurban cars for the Lexington & Interurban.

Couplers.—Catalogue No. 1, recently issued by the Northern Malleable Castings Co., Cleveland, Ohio, has some 50 pages of detailed information for use in ordering and applying Tower and Climax couplers and their repair parts. There are a large number of dimensioned drawings and also a number of half-tones made from transparencies showing the interior of the couplers and relative positions of the various parts.

Drill Sockets and Lathe Dogs.—A folder of the H. Turner Tool Co., Chicago, presents something new in drill sockets and lathe dogs. The drill sockets have a patented depressed key and outside separating device and will drive taper shank drills with or without the tang. The lathe dogs are steel, designed to carry any shape of material. A patented bridge for use with the dogs increases their range. Universal and adjustable designs are made.

Automatic Block Signaling for Steam Roads.—This is the title of a catalogue designated as Section 5, which has just been issued by the General Railway Signal Co., Rochester, N. Y., describing in detail its "Model 5" electric motor semaphore signal and accessories. The book consists of 132 pages and contains not only the usual detailed drawings, with numbers and prices for ordering any part that may be wanted, down to a bushing or a nut costing two cents, but also a dozen full page photographs, clearly illustrating the lower quadrant and the upper quadrant signals, and the motors in different positions. Each photograph is accompanied by a descriptive article clearly showing just how the machine works. The preface to this catalogue contains an interesting historical sketch of automatic block signaling, which is reprinted in this week's issue of the *Railroad Age Gazette.*

Electric Power for the Central of Brazil.

The Central Railroad of Brazil has made a contract with Guinle & Co., Rio de Janeiro, for electric power for operating the sections of the railroad to be electrified. Guinle & Co. have several large electric power plants in different cities in Brazil. The firm has also been given a federal concession for supplying light and power to the city of Sao Paulo. It is expected that the firm will require additional electrical equipment soon; it buys most of its equipment in the United States and maintains an exporting office in New York.

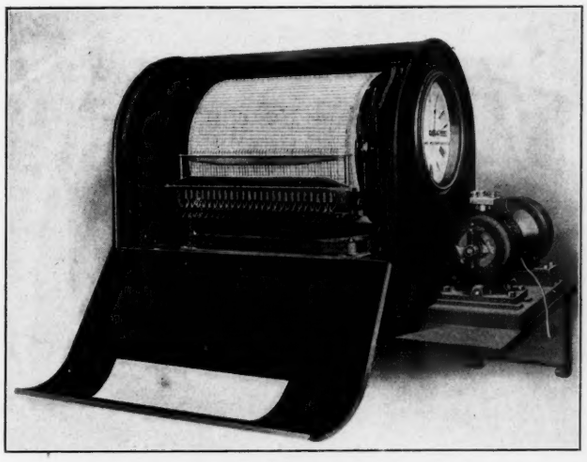
Collapse of Havre de Grace Bridge.

Nearly 600 ft. of false work of the Baltimore & Ohio Bridge over the Susquehanna river at Havre de Grace, Maryland, collapsed early in the morning of September 23. Twelve loaded coal cars of a northbound freight train fell with the structure and a watchman was perhaps fatally injured. The bridge was being rebuilt and double tracked by the American Bridge Co. It is said that the wreck may have been caused by dynamiting. D. D. Carothers, Chief Engineer of the B. & O., and officers of the American Bridge Co., are quoted as saying that there was nothing to indicate that the structure was weak and it was secure when inspected at the end of the day before the accident.

The National Machine Recorder.

The best that is ordinarily possible, even with the most perfect cost system, is to determine exactly how long a workman has been engaged on a certain operation, exhibiting the final cost, and by continual comparison with costs on similar work endeavor to detect waste of time. An adequate and carefully conducted cost system will obtain costs and perhaps detect flagrant waste of time, but it falls short of obtaining the maximum efficiency of the equipment. For example, the most accurate and therefore most expensive method of obtaining a record of the time consumed in production is to have a time-keeper record the time a man starts and finishes each piece of work. In some plants the operators report their own time, but in any event it is very evident that while a workman has been engaged on a job say ten hours, and it was so reported on his time-card, yet he may have spent only six hours in actual production and systematically wasted four hours, which neither the time-keeper nor the cost system could detect.

In some plants tests are made to determine how long it should take to perform each operation and so establish piece rates, but in most plants there are so many operations on each part, that by the time the test has been made on the last operation the rate set on the first would be obsolete, owing to changes and improvements in machine tools, increased efficiency of workmen through continued performance of the same operation, etc., so that there exists in most plants what is known among the piece-workers as "good" and "bad" jobs, evidencing the fact that the piece rates in force are either too high or too low.



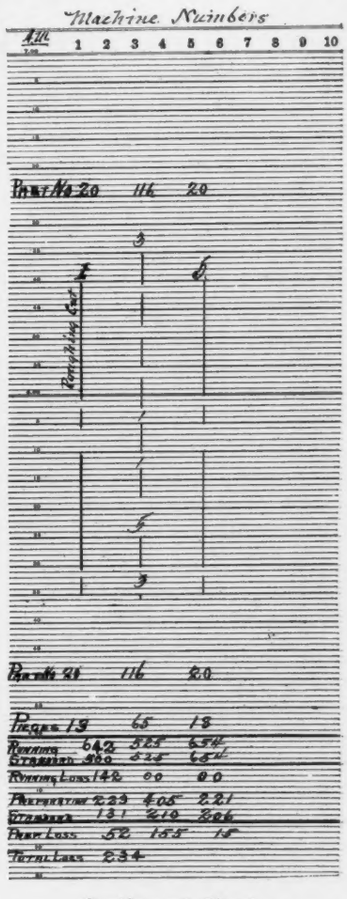
National Machine Recorder.

It is well-known that if the piece rates in force are not in accordance with the capacity of the machine tool when properly operated, the piece rate method of paying labor retards rather than increases production. The usual method of establishing piece rates is to determine the length of time consumed in producing a certain output by day work and to increase this output 10 or 15 per cent., dividing this quantity into the amount earned, the result being the piece rate. This might be accurate if workmen did not anticipate a piece rate on every operation which is now being performed by day work and did not use his ingenuity to curtail production and keep the management in ignorance as to what the actual output should be, so that when the piece rate is established it will be one at which he will have a easy time making his regular wages.

What is needed is an automatic and indisputable record of the operation of each machine tool, establishing an accurate and equitable time limit on every operation performed thereon, thereby removing all suspicion and putting each workman on his merit.

The National machine recorder has been designed to accurately and automatically record the movements of every machine tool in the shop; to exhibit at any and all times the actual length of time the machine has been producing, the duration and time of day of each producing period, also every idle moment and the time of day each idle period occurred. The chart will show exactly how long it has taken a workman to pick up a part from the truck or floor and insert it in his machine, the length of time the machine was at work, and the time consumed in taking out this part and inserting the next one. It will also show whether a variable speed machine is being operated to the best advantage or not. It will tell the time consumed in making the roughing cut and also the finishing cut, so that it can be seen at a glance whether the operator is shifting his belt properly. One of the most important features of this record is that the information of all irregularities is obtained during the operation, making it possible to stop the leak at once. The moral effect on the operators, knowing that every waste moment is undeniably recorded, cannot fail to increase the efficiency of the plant.

The recorder is in the superintendent's office, each machine tool being connected by wire to its respective marker on the recorder, so that an employee cannot tamper with it. The apparatus consists of a horizontal drum 17½ in. wide, mounted on a shaft which is driven by a motor spring, the speed of the shaft being regulated by a clock movement. A prepared chart, clamped on the face of this drum, is ruled horizontally for 12 hours, each line representing a minute. The numbers at the top from 1 to 50 represent the different machines. The accompanying reproduction of part of this chart is half size. A frame in front of the drum carries a row of 50 metallic markers or points, each point being actuated by electro-magnets and connected electrically with one of the shop machines. The connection is made with the belt shifting lever by which the machine is started or stopped, the rod of the shifter running between two spring blades. When the shifter is thrown over to start the machine, the rod makes a contact, the blades completing the circuit and bringing the corresponding marker of the recorder in contact with the sheet on the revolving drum. This contact continues while the machine is running so that a line is traced upon the sheet during the operation of the machine, and when the machine is stopped the circuit is broken, withdrawing the marker from the paper and showing a blank space.



Section of Chart.

An index card is opened for each operation on every part manufactured. From the readings of these charts a standard time is to be established for each part of each operation, and from such information the person operating the recorder is to figure waste of time continuously during the day.

It will be seen on the portion of a chart here reproduced—part No. 20 produced on machine No. 1—that there are two cuts, a roughing cut and a finishing cut. The standard time for the roughing cut is 20 minutes and for the finishing cut three minutes. The standard time for preparation is two minutes for adjusting the cutting tool between cuts and five

minutes for taking the finished part out and inserting the next one.

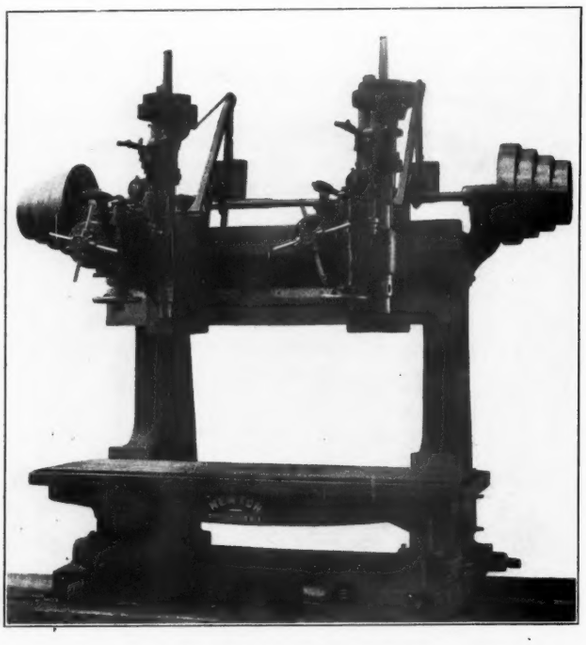
The pieces produced are counted on the complete chart and checked against the actual count of parts produced, which in this instance was 13, but because the operator did not use the proper speed on his finishing cuts in six instances, there was a loss of 1 hour and 42 minutes in the running time. There was also a loss of 52 minutes in the preparation time, which is the aggregate time of the individual delays throughout the day, showing a total loss for that machine during the day of 2 hours and 34 minutes.

On this chart, part 20 is shown as being produced on machine 5 also, the comparison obtained here showing that the operator on machine 5 has only lost 15 minutes, that being on the preparation of parts, but he has turned out nearly 50 per cent. increased output. The bottom of this chart is perforated and the perforated slip placed on the manager's desk, giving him a complete record of the net efficiency of every machine in the shop. However, these delays are supposed to be eliminated immediately as they occur, the operator of the chart calling the foreman's attention to them, so that when the perforated slip is placed on the manager's desk and the waste time is shown to be considerable, he can examine the details of this waste of time and call to task the man operating the chart for not stopping the delays at once or place the blame wherever else it belongs.

The recorder was invented by T. A. Cooney, and is manufactured by the National Machine Recorder Co., Marquette building, Chicago.

Newton Double Spindle Drill.

The double spindle drilling machine recently built for the H. K. Porter Co., Pittsburgh, Pa., is illustrated in the accompanying half-tone. The spindles of this machine are 3¼ in. in diameter and counterweighted, with three changes of geared feed with adjustable automatic release and four changes of belt speed in addition to the 2 to 1 geared speed, making eight speeds in all. The drive for each head is arranged so that

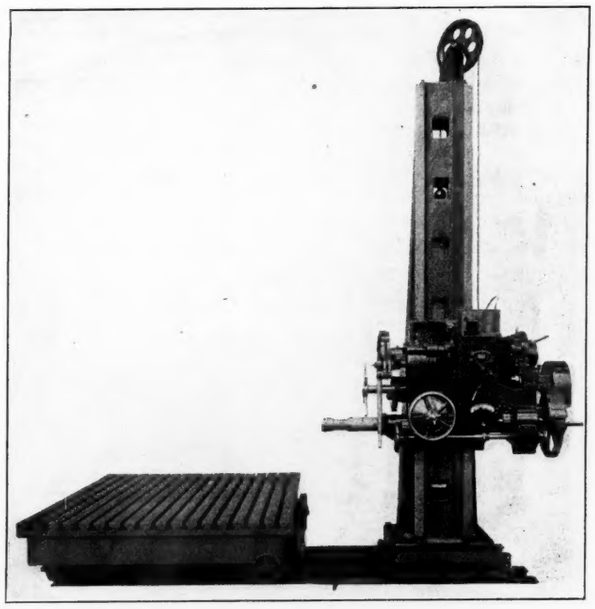


Newton Double Spindle Drill.

the drills can rotate independently. The spindles are arranged with hand rapid vertical adjustment. They can be adjusted outward from the saddle for a maximum distance of 17 in. and a minimum of 8 in. from the face of the rail. Saddles can be adjusted on the rail for a maximum of 60 in. between centers of spindles and a minimum of 12 in. The work table is 20 in. wide and 6 ft. 5 in. long; it is surrounded by an oil trough. The table has a vertical movement of 18 in., the minimum distance from the top of the table to the bottom of the spindle being 18 in. These machines are built with two or more saddles on the rail. The uprights in the machine illustrated herewith are 56 in. apart, but these machines are built to be of any required distance between uprights. The Newton Machine Tool Works, Inc., Philadelphia, Pa., is the designer and builder of this machine.

Horizontal Drilling and Boring Machine.

The illustration shows a Pawling & Harnischfeger horizontal drilling and boring machine in use in the West Milwaukee shops of the Chicago, Milwaukee & St. Paul. The company makes six styles of this machine, the one here shown being No. 3. This machine will cover 65 sq. ft. for drilling and



Horizontal Boring and Drilling Machine.

tapping up to 3 in. holes and for boring with boring bars. The vertical carriage travel is 7 ft. 8 in. and the table dimensions 8 ft. x 6 ft. x 17½ in. The floor space is 15 ft. x 35 ft. The diameter of the spindle is $2\frac{7}{16}$ in., and the horizontal spindle feed 24 in. or 30 in. There are eight spindle speeds ranging from 7 r.p.m. to 200 r.p.m., and four feed changes with each spindle speed.

These drill presses are designed for every class of drilling that can be done on any other type of machine, using drills from ⅜ in. or ½ in. to 3 in. Drills smaller than ⅜ in. are also usable with careful handling, but machines having the capacity of these are naturally not well adapted to sensitive drilling. The spindle sockets of the No. 1 and No. 3 machine are Morse taper No. 5, which is the size of shank for a 3-in. drill. The No. 2 and No. 4 machines are made for Morse taper No. 6, which fits them for special drills over 3 in. These machines will do all sizes of machine tapping, and for pipe tapping the No. 1 and No. 3 will handle taps to about 4 in. and the No. 2 and No. 4 machines to about 7 in., cutting full threads. This gives an idea of the driving power of the machines. For tapping, some form of chuck is used, not necessarily a tapping chuck, as the machines are arranged for reversing the spindle rotation.

The machines are said to be specially adapted for driving bars for boring, due to their rigidness and long horizontal spindle travel, the method of supporting the spindle giving true alinement for full travel. Their stability enables them to bore and face without chattering. The direct traverse of the spindle in either direction and the locking and unlocking of the power feed is made with one large hand wheel. This attachment, which is a patented feature on all machines, is a simple and positive device for controlling the spindle movement. It consists of a large-area cone friction disk on the shaft, with a pinion that meshes with a rack on the spindle

sleeve. The disk is engaged or disengaged with a worm gear, through hardened tool steel helices on the hubs of the disk and hand wheel. With the disk and worm gear locked, the hand or power feed is made through the worm shaft. To move the spindle independently of the feed, the disk is prevented from locking by a few turns of the star nut outside of the hand wheel.

All these machines cover a large working surface area, varying in the different sizes from 60 to 78 sq. ft. with one setting of the work. For machining long structural shapes light trucks are used as trailers for the parts overhanging the machine table. Where much duplicate work is done, special fixtures for receiving the work may be attached to the table, such as a turntable for revolving the work to machine any side or angle.

The machine here shown has a foundation of I-beams embedded in concrete, to which are bolted the base-plate of the machine and the rails for the table track.

The No. 4 machine has no table and is intended to be used as a portable machine when it is more convenient to take the machine to the work than to move the work to the machine. The range of this machine is greater than any of the others. At the Allis-Chalmers Co.'s Milwaukee works, where six of these No. 4 machines are used, there is a large area of floor made of heavy cast iron T-slotted plates accurately leveled, on which most of the heavy work is machined with these machines and other portable tools that are lined up to the work.

The Allis-Chalmers Co. has some 35 of these machines in use. Other large industrial concerns such as The Bucyrus Co., the C. & G. Cooper Co., the American Locomotive Co.'s Richmond works, the Canada Foundry Co., and the Nordberg Manufacturing Co. have them, but the Chicago, Milwaukee & St. Paul is the first railroad company to install one. The Pawling & Harnischfeger plant is at Milwaukee, Wis.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Dennis Searles has been appointed Assistant to the President of the Tonopah & Tidewater, with office at Oakland, Cal.

Chester W. Bliss has been elected a director of the Boston & Albany, succeeding his father, William Bliss, deceased.

George T. Reid has been appointed General Western Counsel of the Northern Pacific, with office at Tacoma, Wash., succeeding B. S. Grosscup, resigned.

D'Arcy Scott, Mayor of Ottawa, Ont.; Professor S. J. McLean and the Honorable T. Greenway have been appointed on the Board of Railway Commissioners for Canada.

The following new directors of the Mexican Central were elected at the annual meeting September 23, 1908: Hans Winterfeldt, Walter R. Rosen, D. P. Bennett and Geo. W. Wickersham.

Charles T. Lewis has been elected Second Vice-President of the Toledo & Ohio Central, succeeding James M. Ferris, deceased. John Landgraf, Jr., Auditor, has been appointed also Secretary, which office was previously held by Mr. Ferris.

Operating Officers.

A. E. Wallace has been appointed Trainmaster of the Chicago, Burlington & Quincy, at Sheridan, Wyo., with jurisdiction over the Sheridan division west. M. C. Hughes has been appointed Trainmaster at Sheridan, with jurisdiction over the territory from Sheridan to Edgemont, S. Dak.

Charles H. Osborn, the recently appointed Assistant Superintendent, Car Department, of the Chicago & North-Western, was born at Westfield, Mass., in 1875. After graduating from Sheffield Scientific School, Yale University, in 1895, he began railroad work in September on the Chicago & North-Western as special machinist's apprentice in the Chicago shops. By 1899 he had become round house foreman at Green Bay, Wis., and the next year was transferred to Escanaba, Mich., as round house foreman. In 1904 he was appointed Division Foreman at Fond du Lac, Wis., and three years later was made Master Mechanic of the Madison division, with office at Baraboo, Wis., which position he held until his recent appointment.

Traffic Officers.

A. B. Collins has been appointed Soliciting Freight Agent of the New Orleans & Northeastern, succeeding W. F. Rogers.

G. H. Griffin has been appointed City Passenger Agent of the Canadian Pacific at Buffalo, N. Y., succeeding R. A. Burford.

T. W. Wuerpel has been appointed General Agent of the National Lines of Mexico and the Mexican Central at Monterey, Mex.

Nathaniel Green, Manager of the Frank Zotti Steamship Co., has been appointed City Passenger Agent of the Chicago & Alton at New York.

H. O. Yant, Agent of the Toledo & Ohio Central at Findlay, Ohio, has been appointed Traveling Freight Agent at Toledo, succeeding Frank Kiley, resigned.

John L. Sullivan has been appointed Traveling Freight Agent of the Chicago Great Western at Fort Dodge, Iowa, succeeding W. S. Wheaton, resigned.

D. P. Brown has been appointed Chief Clerk, Passenger Department, of the Eastern of New Mexico and the Southern Kansas Railway of Texas, at Amarillo, Tex.

J. B. DeFriest has been appointed General Eastern Freight and Passenger Agent of the Union Pacific, with headquarters in New York, succeeding R. Tenbroeck, retired.

W. D. Clifton has been appointed Traveling Freight Agent of the Nebraska and Wyoming divisions of the Union Pacific, with office at Omaha, Neb., succeeding J. G. Lowe, promoted.

Benjamin Wagner has been appointed Traveling Freight Agent of the Chicago, Indiana & Southern at Streator, Ill., succeeding Thomas Brennan, resigned to accept service elsewhere.

E. L. Cory has been appointed Traveling Freight Agent of the Evansville & Terre Haute, succeeding P. H. Byers, resigned to engage in general merchandise business at Poseyville, Ind.

M. Walsh, Inspector of Trains and Agencies of the Atlanta, Birmingham & Atlantic, has been appointed Commercial Agent at Cincinnati, Ohio. O. M. Williams, Local Agent at Waycross, Ga., succeeds Mr. Walsh.

H. B. Dunham, General Freight Agent of the Hocking Valley, has been appointed Traffic Manager. H. Q. Wasson, Assistant General Freight Agent, succeeds Mr. Dunham, and his former office has been abolished.

Elmer Smith, Passenger and Ticket Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Cairo, Ill., has been appointed Passenger and Ticket Agent at Memphis, Tenn., succeeding C. E. Rountree, resigned.

N. E. Townsley, whose resignation as General Agent of the Southern Pacific has been announced in these columns, has left railroad work to become Vice-President of the Manhattan Motor Car Co. and of the Nickerson & Collins Co., publishers, Chicago.

P. W. Johnston, City Passenger Agent of the Chicago, Rock Island & Pacific and of the St. Louis & San Francisco at Wichita, Kan., has been appointed Traveling Passenger Agent there, succeeding R. L. Baker, resigned to engage in other business.

E. G. Spencer, Soliciting Freight Agent of the Kansas City Southern at Kansas City, Mo., has been appointed Traveling Freight Agent at Kansas City, succeeding W. D. Pratt, resigned to engage in other business. F. E. Browne succeeds Mr. Spencer.

W. H. Wylie, Commercial Agent of the Wabash at St. Louis, Mo., has been appointed Assistant General Freight Agent at St. Louis, succeeding R. N. Collyer. H. G. Holden, Chief Contracting Agent, succeeds Mr. Wylie, and B. H. Coyle, Contracting Agent, succeeds Mr. Holden.

A. E. Buck, Commercial Agent of the St. Louis, Brownsville & Mexico at Corpus Christi, Tex., has been appointed Commercial and City Ticket Agent at Houston, Tex., succeeding C. J. Peyton, who has been transferred to Corpus Christi, succeeding Mr. Buck.

Edward Fitch has been reappointed Southwestern Passenger Agent of the Missouri Pacific, with office at San Antonio, Tex. Mr. Fitch held this position until last February, when the office was abolished, and had since been in a wholesale grocery business at Corpus Christi, Tex.

J. C. Finch, Commercial Agent of the Missouri, Kansas & Texas at Oklahoma City, Okla., has been appointed Assistant General Freight Agent, with office at Kansas City, Mo., succeeding R. F. Campbell, resigned to engage in other business. L. B. Chipley succeeds Mr. Finch.

E. L. Jameson, Assistant General Freight Agent of the Toledo & Ohio Central and the Kanawha & Michigan, has been appointed General Freight Agent of these lines, succeeding Hudson Fitch, promoted to Traffic Manager, and the office of Assistant General Freight Agent is abolished.

John C. Maher, Contracting Agent of the Great Northern at Spokane, Wash., has been appointed Traveling Freight Agent at Spokane, succeeding W. C. Wilkes, resigned to go to the Portland & Seattle, at Portland, Ore. P. R. Flanagan, chief clerk in the General Agency at Spokane, succeeds Mr. Maher.

E. D. Parker, Assistant General Freight Agent of the Minneapolis, St. Paul & Sault Ste. Marie at St. Paul, Minn., has had his jurisdiction extended over the entire line, and his headquarters will hereafter be at Minneapolis, Minn. A. L. Preston, General Agent at Winnipeg, Man., has been transferred to St. Paul as General Agent in the freight department, and will perform some of the duties heretofore performed by Mr. Parker. J. C. Peterson succeeds Mr. Preston.

H. A. Poveleite, General Freight Agent of the Cincinnati, New Orleans & Texas Pacific at Cincinnati, Ohio, has been appointed Manager of the new Queen & Crescent fast freight line between New Orleans and Chicago. S. A. Williams, Commercial Agent of the Alabama Great Southern at New Orleans, has been appointed Commercial Agent of the new line, and W. F. Rogers, Soliciting Freight Agent of the New Orleans & Northwestern, has been appointed Soliciting Freight Agent of the fast freight line.

Engineering and Rolling Stock Officers.

George S. Foster has been appointed Division Engineer and Bridge Inspector of the Chicago, Cincinnati & Louisville at Chicago, succeeding E. B. Espenshade, resigned.

R. R. Royal has been appointed foreman in the locomotive and car department of the Mobile, Jackson & Kansas City at Louisville, Ky., succeeding G. W. Brewer, assigned to other duties.

William Corliss has been appointed Roadmaster of the Union Pacific, having jurisdiction over the line between Laramie, Wyo., and Cheyenne, succeeding E. J. Borland, transferred.

C. C. Reynolds has been appointed Road Foreman of Engines of the Atchison, Topeka & Santa Fe (Coast Lines) at Winslow, Ariz., with jurisdiction over the Albuquerque division, succeeding William Daze, promoted.

William Duane, Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, effective November 1, to become Vice-President and General Manager of the Walsh Railroad Construction Co., Davenport, Iowa.

M. S. Curley has been appointed Master Mechanic of the Beaumont, Sour Lake & Western, the Colorado Southern, New Orleans & Pacific and the Orange & Northwestern at Beaumont, Tex., succeeding A. L. Moler, resigned.

Charles Anderson, General Inspector, Car Department, of the Wabash, has been appointed General Foreman, Car Department, at Toledo, Ohio, succeeding Frank Howard. A. S. Sternberg, Car Foreman at Landers, Ill., succeeds Mr. Anderson. C. E. Stough succeeds Mr. Sternberg.

David Patterson, the recently appointed Master Mechanic of the Kansas City, Mexico & Orient, was born in Paterson, N. J., in 1860. After a public school education in Chicago, he began railroad work in 1874 on the Union Pacific at North Platte, Neb., as a machinist's apprentice. He was successively to September, 1897, machinist, foreman and Master Mechanic. He was then appointed Master Mechanic of the Kansas City Southern, and in 1901 was appointed Master Mechanic of the Denver & Rio Grande. Three years later he was appointed Master Mechanic of the Colorado Southern at Denver, Colo., which office he held until his recent appointment.

Special Officers.

B. A. McAllaster, Land Commissioner of the Union Pacific at Omaha, Neb., has been appointed Land Agent of the Southern Pacific, the Central Pacific and the Oregon & California at San Francisco, Cal.

OBITUARY.

Robert D. Hughes, Superintendent of the Western division of the American Express Co., died at Cleveland, Ohio, on September 22.

M. W. Mansfield, Assistant Chief Engineer of the Pennsylvania Lines West of Pittsburgh, died at Indianapolis, Ind., on September 25, at the age of 58 years. Mr. Mansfield was a graduate of Rensselaer Polytechnic Institute. He began railroad work in 1871 on the construction of the eastern end of the Cleveland & Mahoning Valley. He was later, until 1885, an engineer on the same road and of the Chicago, St. Louis & Pittsburgh, both roads now belonging to the Pennsylvania Lines West. From 1885 to November, 1906, he was Superintendent of the Pennsylvania Lines West at Indianapolis, Ind. In November, 1906, he was appointed Assistant Chief Engineer, with headquarters at Pittsburgh, Pa. Early in the present year he was granted an extended leave of absence on account of ill health, and returned to Indianapolis, his former home.

Railroad Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—The report of this company for the year ended June 30, 1908, gives a total of 9,430.6 miles for the lines included in this system, as compared with 9,350.28 miles in 1907, an increase of 80.32 miles. The average mileage operated during the year ended June 30, 1908, was 9,415.01, an increase of 141.86 miles as compared with the preceding year. In addition to lines covered by this report, the company had finished on June 30, 1908, the Eastern Railway of New Mexico, a low-grade short line for transcontinental traffic from Texico, N. Mex., west to Rio Puerco, 265.93 miles, which was opened for traffic on July 1, 1908. Branches of this road were built from Clovis, N. Mex., to Cameo, 8.97 miles, and from Dalies to Sandia, 3.56 miles. The Arkansas Valley extension, including the line of the Holly & Swink Railway and the Arkansas Valley Railroad through the beet sugar district of the Arkansas valley, in Colorado, 106.56 miles, was also built, and this mileage, as well as that of the Eastern of New Mexico, will be included in the operated mileage after June 30, 1908. There were also 110.75 miles of additional line constructed which was not ready for operation on July 1, 1908. The other improvements under way or finished include a bridge for the Arizona & California over the Colorado river between Arizona and California, to which point a line was built last year. An extension of the line west to a junction of the main line in California is to be carried out when conditions warrant further construction. An extension of the Pecos & Northern Texas, which is part of the system of the Eastern Railway of New Mexico, to a point on the Gulf, Colorado & Santa Fe, to establish a low-grade short line in connection with the Eastern Railway of New Mexico for traffic between the Gulf of Mexico and Pacific coast points, is to be built when conditions are more satisfactory. On the Jasper & Eastern, a section from Cravens, La., east to Oakdale, 23.7 miles, was opened for traffic in February, 1908. During the year, work was started and

grading about finished for an extension of the Texas & Gulf from Zuber, Tex., to a connection with the Gulf, Beaumont & Great Northern at Center.

BUENA VISTA & MAUK.—E. B. Hornady, of Buena Vista, Ga., is said to have announced in Columbus, Ga., that he has secured the necessary funds for building 18 miles of line from Mauk, Ga., southwest to Buena Vista. It is said that construction work will be started soon.

BUFFALO SOUTHERN (ELECTRIC).—Officers of this company are quoted as saying that the new extension to East Aurora, N. Y., will be in operation by November 15. The distance from the city line of Buffalo at Seneca street to the East Aurora terminus is 12 miles.

CALIFORNIA COMPANY.—Recently incorporated in California with $2,500,000 capital stock, as a preliminary merger company to include the Bay Counties Railway, the Napa & Sacramento, and the Napa & Vaca Valley, and to build a main line from Richardson's Bay, Cal., northeasterly to Sacramento, about 90 miles. Branch lines are also proposed from Gallinas creek north to Petaluna, 18 miles, and from the Stanley lands northward into Napa, 5 miles. Surveys are now being made for a route from Richardson's Bay to Tiburon, San Quentin, Point Pedro, Petaluma, and thence northeast to Sacramento. Charles W. Conlisk, of San Francisco, a stockholder, is credited with having said that 1,200 acres of tide lands had been purchased on the north side of Richardson's bay, which will be used for terminals, and that the purpose of the road was to furnish a terminus for an additional trans-continental line to San Francisco. The company eventually expects to build a line through Oregon to connect with the Northern Pacific. Announcement has been made that work will begin about January 1.

CAROLINA, CLINCHFIELD & OHIO.—The McArthur Bros. Co., contractors, with office at Spartanburg, S. C., are asking for bids up to October 3, at 1 p. m., for building 31 miles of the extension of this road between Bostic, N. C., and Spartanburg, S. C. The work involves 2,000,000 cu. yds. of steam shovel and team work, 35,000 cu. yds. of concrete masonry, and pile and trestle bridges, etc. Work will be divided in sections to suit contractors who can complete the respective sections in five months.

CENTRAL OF GEORGIA.—It is said that a petition has been sent to this company by the towns of Bremen, Ga., and Bowden asking that a branch about 16 miles long be built between these two places. Bremen is the point of intersection of the Southern and the Central of Georgia.

It is said that engineers are completing surveys in the neighborhood of Americus, Ga., for straightening curves and reducing grades.

CHICAGO, OTTAWA & PEORIA (ELECTRIC).—See Western Railways & Light Co.

COLORADO & SOUTHERN.—A survey is being made from Wellington, Col., to Cheyenne, Wyo., 43 miles, for a proposed extension to connect the Wyoming division with the Colorado division. (July 24, p. 600.)

DALLAS & NEW MEXICO.—An officer of the new holding company writes that in all probability contracts will be let late in October for the first section of this projected line. The company has acquired coal lands in Jack and Young counties, Tex. It is expected to have the first 50 miles in operation by April, 1909. (Sept. 18, p. 980.)

DELAWARE & EASTERN.—Local reports say that W. J. Oliver & Co., Knoxville, Tenn., have secured contracts for construction work from Grand Gorge, N. Y., northeast to Schenectady. (June 12, p. 95.)

GEORGIA, SOUTHWESTERN & GULF.—It is said that contracts for construction work on this line will not be let for some time. T. H. Hazelrigg, 126 E. Market street, Indianapolis, Ind., is interested in this work. (July 24, p. 600.)

GREAT NORTHERN.—Work on the branch from Columbia river siding north and east into Douglas county, Washington, has been begun. The company has had the question of building this branch under consideration for some time, the surveys being made two or three years ago. It will run midway between the Northern Pacific line and the Columbia river and will penetrate a wheat raising area which has heretofore had almost no facilities for moving its products. The line as laid out at present will be about 44 miles long. The terminus has not yet been decided on, as there is a possibility that the road will run further to a connection with the projected line from Wenatchee to Oroville. As soon as all equipment and materials have been assembled, the present force will be doubled and the work rushed as rapidly as possible.

Sub-contracts for work on the extension of the Vancouver, Victoria & Eastern in the vicinity of Princeton, B. C., are said to have been let to Erickson & Co., Williams & Co., Johnson & Co., H. B. Richardson, Anderson & Co., Freeden & Co. and the Larson Co. These contracts, it is said, are mostly all rock work. (R. R. G., May 15, p. 687.)

ILLINOIS CENTRAL.—See note on first page of General News Section concerning prospects of Illinois Central electrification.

INDIANA ROADS (ELECTRIC).—According to reports from Evansville, Ind., C. E. Lockyear, of that place, is back of a project to build an electric line from Evansville, northwest to Olney, Ill., about 65 miles. Surveys are to be started this fall.

LEHIGH VALLEY.—The report of this company for the year ended June 30, 1908, which is reviewed elsewhere in this issue, shows that this company operates 1,445.69 miles of road, of which 588.46 miles has second track, 59.86 third track, and 23.87 miles fourth track. There are also 1,110.61 miles of yard tracks and sidings. The increased mileage of first and second track is due to the completion of the Lehigh & Lake Erie branch, a 10-mile double track terminal line at Buffalo, N. Y., which was finished and put in operation early in the year. During the year, 60.16 miles of company's sidings were added, and 5.82 miles of private sidings. About 12,225 tons of new 90-lb. rails were laid. Four new bridges were built in connection with second, third and fourth track work, and 39 bridges to replace old wooden or iron bridges of light construction. Four bridges were filled in. Additional yard and terminal facilities at Tifft Farm, N. Y., have been finished and put in operation; these improvements, in connection with the new Lehigh & Lake Erie branch, give the company a continuous double track line from the Great lakes to the Atlantic seaboard. The new yard with transfer bridges at the National Docks terminal and the renewal of four transfer bridges at Jersey City have been finished and put in operation. To avoid replacing the present wooden trestle on the high-grade line at Greenville, plans have been adopted for a permanent embankment and steel viaduct, on a revised line and grade, at an approximate cost of $450,000. The work is proceeding slowly, the expenditures to date being only about $77,500.

MEMPHIS, PARIS & GULF.—Local reports say that C. W. Dodson, to whom a contract was recently let, wants to sublet 15 miles of grading between Nashville, Ark., and Murfreesboro. (Sept. 25, p. 1028.)

MILWAUKEE NORTHERN.—According to reports from Milwaukee, this company recently opened for operation its extension from Cedarburg, Wis., north to Sheboygan, 30 miles. Work is now under way on a northwest branch from Cedarburg, via West Bend, to Fond du Lac, which, it is expected, will be finished this year. (July 17, p. 559.)

MISSISSIPPI RIVER-WESTERN.—An officer writes that this company was to have held its annual meeting this week, at which time the question of letting contracts for work was to be decided. The company was organized to build from Meridian, Miss., southwest, via Sterling, Wanetta, Fellowship, Rose Hill, Gridley, Stevens, Sylvarena, Raleigh, Mendenhall, Hazelhurst and Harriston, to Natchez, 165 miles. W. A. Wall, Raleigh, Miss., may be addressed.

MISSOURI, KANSAS & TEXAS.—This company, in the year ended June 30, 1908, according to the annual report, laid new 85-lb. rails on 49.46 miles of track and ballasted 162 miles. The work of renewing the light bridges of the southern divisions was finished, so that heavy engines may now be run through to Houston, Tex., and San Antonio. Satisfactory progress was made in reducing grades on the section between Atoka, Ind. T., and the Red river, and this work is now nearly completed. A reduction of southbound grades between McAlester, Ind. T., and Atoka remains unfinished, the work hav-

ing been suspended on account of unfavorable financial conditions. Considerable work was done at Dolan Hill, on the Atoka branch, and is still in progress. Surveys for grade reduction have been continued north as far as Paola, Kan., and it has been found possible to make the gradient north of Muskogee, Ind. T., as low as 0.3 of 1 per cent.

Missouri River & Northwestern.—See Rapid City & Wyoming Valley.

New York & North Shore Traction.—The Up-State New York Public Service Commission has granted this company permission to build an extension from Hicksville, L. I., west six miles to Mineola. The company is said to have funds and to be ready to build the extension this year.

Oklahoma, Kansas & Missouri Interurban.—An officer writes that this company, organized with $100,000 capital in Oklahoma, has given a grading contract to John Hall, of Miami, Okla., for work on a line from Miami north about 5 miles to a mining camp. The company proposes to use gasolene motor cars on the line. Franklin M. Smith, President, and John Hall, Chief Engineer, both of Miami.

Pennsylvania.—Vice-President Samuel Rea, in charge of the construction of the company's New York City terminal work, is quoted as follows: "The report that the New York tunnel extension of the Pennsylvania would be open for traffic in the spring of 1909 is unauthorized. The management has no further announcement to make regarding the completion of the tunnels other than that made to the stockholders in the annual report of 1907, to the effect that the tunnels and terminal station would be finished in 1910. It is expected that all the work on the tunnels will be finished this coming winter, but at least a year will be required for laying main tracks and yards, completing the New York station building and electrifying the main lines and yards."

Rapid City & Wyoming Valley.—Recently organized in South Dakota with $500,000 capital and office at Rapid City. The incorporators include H. W. Jones, J. C. Haines, F. H. Rugg, H. E. Swanger, W. F. Pascal, E. M. Reeves, L. A. Richards, G. P. Bennett and T. Sweeny, all of Rapid City. It is said the company has been formed to take over the property and interests of the Missouri River & Northwestern, which is in operation from Rapid City, S. Dak., west to Mystic, 34 miles, and is now in the hands of a receiver.

Sanoody Valley Railroad.—Local reports say that arrangements have been made to begin construction on this line at once. S. O. Bell, President, De Kalb, Miss. (July 17, p. 555.)

Seattle Electric.—Stone & Webster, Boston, Mass., have bought the rights and property of the Seattle-Everett Interurban. The latter was organized by Fred E. Salder, and associates, Seattle, Wash., to build an electric line in Washington to connect Seattle, Ballard, Edmonds and Everett. Part of the line has been finished. The property will be consolidated with that of the Seattle Electric Company and the road extended from Everett north to Bellingham.

Seattle-Everett Interurban.—See Seattle Electric.

Texas State Railroad.—An officer of the state penitentiaries at Tyler, Tex., writes that the Texas State Railroad has been finished from Rusk, Tex., west 17 miles, to a point nine miles west of the Neches river. Work is now under way, with convict labor, extending the line further west toward Palestine, which is 30 miles from Rusk. The work will be heavy. J. W. Wright, Financial Agent of Penitentiaries, Tyler. (R. R. G., April 26, p. 600.)

Western Railways & Light Co.—This company owns all the capital stock of the Chicago, Ottawa & Peoria, organized to build an electric line from Peoria, Ill., north and thence east to Chicago, about 175 miles. The line is now in operation from Princeton, Ill., east to Seneca, 58 miles. Work will, it is said, be started at once on a branch from the main line at Ottawa south to Streator, 16 miles.

Wisconsin & Northern.—A contract, it is said, has been given by this company for building a branch line from the main line at Neopit, Wis., west to a point about 2 miles east of Phlox, 12 miles. About 600 men are to be put to work to finish the line by Jan. 1, 1909.

Railroad Financial News.

Canadian Northern.—Wm. A. Reed & Co., New York, are offering $1,700,000 first mortgage 4½ per cent. "R" bonds issued by the Imperial Rolling Stock Co. and guaranteed principal and interest by the Canadian Northern. Bonds are due $170,000 yearly, March 1, 1909 to 1918, inclusive. They are secured by a first mortgage on equipment costing $2,268,000.

Chicago & North-Western.—During June land in Chicago valued at $3,807,250 was transferred to the Chicago & North-Western, making in all 38 pieces of land, valued at $6,634,236, which the Chicago & North-Western has acquired for a terminal site.

Chicago, Ottawa & Peoria (Electric).—This company, whose entire capital stock is owned by the Western Railways & Light Co., has filed a mortgage securing an issue of $5,000,000 5 per cent. 20-year bonds, guaranteed by the W. R. & L. Co. The line is in operation between Princeton, Ill., and Seneca, 58 miles.

Metropolitan Street Railway Co.—See New York City Railway. See also Twenty-eighth & Twenty-ninth Street Crosstown.

Missouri River & Northwestern.—This company, which has been in the hands of a receiver since June 12, and which operates a line between Rapid City, S. Dak., and Mystic, 35 miles, is to be taken over, it is said, by the Rapid City & Wyoming Valley, which was organized with $500,000 capital for this purpose. (July 31, p. 648.)

New York City Railway.—Judgment has been entered in favor of the New York City Railway against the Metropolitan Securities Co. for $4,964,000 and interest, by Judge Ward in the United States Circuit Court. It is understood that this is the balance of the sum which the Securities company agreed to pay the City railway. The Securities company claimed that it had agreed to lend the City railway a certain sum to pay the City railway's obligations to the Metropolitan Street Railway and had accepted as collateral $8,000,000 Metropolitan Street Railway notes. The court held that in effect the Securities company had agreed to buy these notes from the City railway and that therefore the Securities company could not recede from its agreement on account of the insolvency of the City railway.

New York, New Haven & Hartford.—The annual report for the fiscal year ended June 30, 1908, has been sent to stockholders and will be reviewed in the *Railroad Age Gazette* of next week.

Pittsburgh, Shawmut & Northern.—The New York Upstate Public Service Commission has authorized the receiver to issue $95,700 6 per cent. three-year notes in payment for 6 locomotives. (Jan. 24, 1907, p. 138.)

Pontiac, Oxford & Northern.—At the auction on September 17, there were no bidders for this road at the upset price of $700,000. The price has been reduced to $400,000 and the sale set for November 19.

Rapid City & Wyoming Valley.—See Missouri River & Northwestern.

Second Avenue Railroad.—Justice Bischoff in the New York State Supreme Court has appointed George W. Linch receiver. The Second Avenue is leased to the Metropolitan Street Railway. The appointment of the receiver was in connection with the suit brought to foreclose the first consolidated mortgage under which $5,631,000 5 per cent. bonds are outstanding.

Sierra Madre & Pacific.—It is said that the Cole-Ryan interests have acquired this road, which runs from El Paso, Tex., to Terrazas, Chih., Mex., 156 miles.

Twenty-eighth & Twenty-ninth Street Crosstown (New York).—Joseph B. Mayer has been appointed temporary receiver by Justice Gerard, of the Supreme Court of New York State. This horse car line has been operated by the receivers of the Metropolitan Street Railway. All the stock of the crosstown road is owned by the Metropolitan Securities Co.

ANNUAL REPORT

LEHIGH VALLEY RAILROAD COMPANY—FIFTY-FOURTH ANNUAL REPORT.

Philadelphia, September 24, 1908.

To the Stockholders of the Lehigh Valley Railroad Company:

The Board of Directors herewith submit the fifty-fourth annual report of the business of your company and its allied interests for the fiscal year ended June 30, 1908.

MILEAGE.

The mileage of railroads owned and operated by the Lehigh Valley Railroad Company, the main line of which extends from Jersey City, N. J., to Buffalo and Suspension Bridge, N. Y., is as follows:

	Miles.
Owned, or controlled by ownership of entire capital stock	1,213.57
Controlled by ownership of majority of capital stock	157.21
Controlled by leases	27.88
Total mileage operated (owned and controlled)	1,398.66
Trackage rights over railroads owned by other companies	47.03
Total mileage	1,445.69

—of which 588.46 miles, or 40.70 per cent. have second track; 59.86 miles have third track, and 23.87 miles have fourth track. There are also 1,110.61 miles of yard tracks and sidings on the system.

The increased mileage of first and second track is due principally to the completion of the Lehigh & Lake Erie Branch. The construction of additional third and fourth tracks, as well as yards and sidings, referred to elsewhere in the report, accounts for the changes under those headings.

REVENUES AND EXPENSES.

The following statement shows the gross revenues, expenses and net revenue from the operation of the entire system for the fiscal year: not including other income, compared with similar figures for the fiscal year of 1907.

For the purpose of this comparison the accounts of the previous year have been re-stated to accord with the classification of revenues and expenses ordered by the Interstate Commerce Commission, effective with the beginning of the present fiscal year, and hence will be found at variance with the figures submitted in the previous annual report. This explanation will further apply to certain of the 1907 figures appearing elsewhere in this report and to such statistics as are based thereon.

Gross Operating Revenues.

From	1908.	1907.	Increase.
Coal freight	$16,175,279.94	$15,270,213.84	$905,066.10
Merchandise freight	14,011,301.78	14,864,262.21	852,960.43*
Passenger	4,159,890.47	4,326,118.87	166,228.40*
Mail	209,072.78	217,792.69	8,719.91*
Express	383,558.16	373,953.30	9,604.86
Other transportation	290,232.18	239,180.57	51,051.61
Miscellaneous	280,818.91	229,925.24	50,893.67
Total operating revenues	$35,510,154.22	$35,521,446.72	$11,292.50*

Operating Expenses.

	1908.	1907.	Increase.
Maint. way and structures	$3,496,138.82	$3,344,181.89	$151,956.93
Maint. of equipment	5,987,410.64	6,186,873.82	199,463.18*
Traffic expenses	778,652.95	771,146.18	7,506.77
Transportation expenses	11,367,496.00	11,149,201.39	218,294.61
General expenses	574,006.37	515,927.35	58,079.02
Total operating expenses	$22,203,704.78	$21,967,330.63	$236,374.15
Net operating revenue	$13,306,449.44	$13,554,116.09	$247,666.65*
Ratio of operating expenses to operating revenues.	62.53%	61.84%	0.69%

* Decrease.

REVENUES.

Coal Freight.—The revenue derived from the transportation of coal, including coke, amounted to $16,175,279.94, an increase of $905,066.10, or 5.93 per cent., as compared with the preceding year. This increase is due entirely to the increased tonnage of anthracite coal, the tonnage of bituminous coal and coke having fallen off considerably in the latter months of the fiscal year.

The percentage of coal-freight revenue to total operating revenues was 45.55 per cent., an increase of 2.56 per cent.

The coal and coke tonnage transported, not including supply coal, amounted to 14,522,262 tons, an increase of 377,770 tons, or 2.67 per cent., over the year previous.

The number of tons moved one mile amounted to 2,221,951,783, an increase of 200,042,256 ton-miles, or 9.89 per cent.

The average haul increased from 142.95 to 153 miles, an increase of 10.05 miles, or 7.03 per cent.

The coal tonnage was 54.84 per cent. of the total tonnage hauled during the year, as compared with 51.66 per cent. for the previous year, being an increase of 3.18 per cent.

Merchandise Freight.—The transportation of merchandise freight produced a revenue of $14,011,301.78, a decrease of $852,960.43, or 5.74 per cent., as compared with the previous twelve months. Notwithstanding a gratifying increase during the early part of the year, the subsequent depression in general business caused a material recession in the volume of this traffic before the close of the year.

The percentage of revenue derived from the transportation of merchandise freight to total operating revenues was 39.46 per cent., a decrease of 2.38 per cent.

The tonnage moved, exclusive of company's material, was 11,957,899 tons, a decrease of 1,274,965 tons, or 9.63 per cent.

The number of tons carried one mile amounted to 2,573,085,734, a decrease of 174,135,679 ton-miles, or 6.34 per cent

The average haul increased from 207.61 to 215.17 miles, an increase of 7.56 miles, or 3.64 per cent.

Company's material amounted to 432,145 tons was transported during the year, being an increase of 1,006 tons, or .23 per cent.

General Freight.—The revenue derived from both coal and merchandise freight aggregated $30,186,581.72, an increase of $52,105.67, or .17 per cent., as compared with the previous year.

The entire freight traffic amounted to 26,480,161 tons, being a decrease of 897,195 tons, or 3.28 per cent.

The number of tons carried one mile was 4,795,037,517, an increase of 25,906,577 ton-miles, or .54 per cent.

The average distance carried was 181.08 miles, an increase of 6.88 miles, or 3.95 per cent.

Company's freight, not included in the above, amounted to 2,637,092 tons, an increase of 155,229 tons, or 6.25 per cent.

The total freight-train mileage was 9,039,177 miles, a decrease of 22,880 miles, or .25 per cent.

The average train load of revenue freight was 530.47 tons, an increase of 4.20 tons, or .80 per cent. Including company's freight, the average train load was 550.34 tons, as against 546.18 last year, an increase of 4.16 tons, or .76 per cent.

The average number of tons of revenue freight in each loaded car was 23.40 tons, an increase of 1.57 tons, or 7.19 per cent. Including company's freight, the average carload was 24.28 tons, an increase of 1.63 tons, or 7.20 per cent.

Passenger.—From passenger traffic the revenue amounted to $4,159,890.47, a decrease of $166,228.40, or 3.84 per cent., as compared with the previous year. As in the case of merchandise freight, the increases won in passenger traffic during the early months of the year, were lost by the later decline in business, which was aggravated, in the case of your company, by the closing of many local industries and the passage of a law by the State of Pennsylvania reducing the rates of fare to a maximum of two cents per mile per passenger in that state.

The total number of passengers carried was 4,926,204, a decrease of 255,329, or 4.93 per cent.

The number of passengers carried one mile decreased 3,424,830, or 1.37 per cent.

The average revenue per passenger per mile was 1.684 cents, a decrease of .043 cent, or 2.49 per cent.

The average distance traveled by each passenger was 50.15 miles, an increase of 1.81 miles, or 3.74 per cent.

Passenger train mileage was 3,974,526, a decrease of 110,169 miles, or 2.70 per cent.

The revenue from passengers per passenger-train mile was 104.66 cents, a decrease of 1.25 cents, or 1.18 per cent. The average number of passenger per train was 62.15, an increase of .83, or 1.35 per cent., and the average number of passengers per car was 18.01, an increase of .13, or .73 per cent.

Mail.—The revenue derived from the transportation of United States mails amounted to $209,072.78, a decrease of $8,719.91, due to the passage of an act by Congress reducing the compensation formerly paid by the United States Government for this service.

Express.—The express revenue amounted to $383,558.16, an increase of $9,604.86.

Other Transportation.—The revenue from transportation other than that shown under the preceding headings was $290,232.18, an increase of $51,051.61.

Miscellaneous.—Miscellaneous revenue amounted to $280,818.91, an increase of $50,893.67.

EXPENSES.

Maintenance of Way.—Expenditures amounting to the sum of $3,496,138.82 were made for the maintenance of way and structures, being an increase of $151,956.93, or 4.54 per cent., as compared with the previous twelve months.

During the year four new iron bridges were built in connection with second, third and fourth track work. Thirty-nine iron bridges, replacing old wooden or iron bridges of light construction, were built. One iron and three wooden bridges were filled in.

60.69 miles of single track were fully ballasted and 4.60 miles partially ballasted with stone, for which purpose 158,064 cubic yards of crushed stone were used.

317,650 ft., or 60.16 miles of company's sidings and 30,707 ft., or 5.82 miles of industrial sidings were constructed.

12,224 tons of new 90-lb. rail, together with necessary frogs, switches, etc., were placed in the track.

434,969 tie plates were used.

561,226 cross ties, 1,794,774 ft. B.M., switch ties, 613,970 ft. B.M. bridge ties, and lumber amounting to 2,209,530 ft. B.M. were used during the year.

Interlocking plants were installed at Harlem Avenue Junction with 35 levers, and at West Seneca, with 4 levers. The interlocking plant at P. & L. Junction was rebuilt and increased by 28 additional levers.

12 miles of new telegraph and telephone pole line were constructed, 39.75 miles rebuilt and 70 miles reset.

191.80 miles of new copper, 3.50 miles of new iron and 68.90 miles of second-hand iron wire were used in extending telephone, telegraph and signal wires. 52.35 miles of iron wire and 63.70 miles of copper wire were used in replacing worn-out wires in the same service.

Maintenance of Equipment.—The total expense for maintenance of equipment during the year was $5,987,410.64, a decrease of $199,463.18, or 3.22 per cent., as compared with the previous year. This class of expenses would have shown a much greater decrease, in view of the liberal expenditures for maintenance in the past and the fact that much of the equipment was idle the latter part of the year, had it not been that, owing to an order issued by the Interstate Commerce Commission providing for a uniform monthly depreciation of equipment, the sum of $935,384.69 was charged to operating expenses and set up on the books as an Equipment Replacement Reserve.

Four thousand 100,000-lb. capacity steel coal cars and 1,000 80,000-lb.-capacity steel underframe box cars were purchased and placed in service under Equipment Trust Series J, this equipment having been ordered during the previous fiscal year, as mentioned in the last annual report.

Fifteen steel underframe milk cars and one 8-wheel locomotive crane were purchased and charged to Additions and Betterments. One 80,000-lb. capacity steel underframe box car was purchased for account of the Lehigh & New York Railroad, and charged to that company, as provided in the lease under which that road is operated.

Thirty passenger and freight locomotives, ten switching locomotives, one hundred 60,000-lb. capacity steel cinder cars, six passenger coaches, three library buffet cars and one Russell snow plow were purchased and charged to Equipment Renewal Reserve, carried over from the previous fiscal year and to the Equipment Replacement Reserve set up by order of the Interstate Commerce Commission. The balance remaining to the credit of the latter account at the close of the fiscal year, and available for future use is $573,804.15.

One freight locomotive and thirty-one steel underframe caboose cars were built.

Thirteen locomotives unfit for further service and too light to warrant rebuilding were sold and Operating Expenses charged with the value thereof.

Four locomotives were rebuilt. Sixty-four new fireboxes, two new tender frames and eleven new cisterns were applied. Four 4,500-gal. capacity tenders were constructed. To comply with the New York State law 378 locomotives were equipped with water glasses at an expense of approximately $8,100.

The total number of locomotives at the end of the year was 885, having a tractive power of 23,888,036 lbs., an increase of 28 locomotives and 1,110,778 tractive power pounds.

The average tractive power per locomotive at the close of the year was 26,992 lbs., an increase of 414 lbs., or 1.56 per cent.

One combination passenger and baggage car, 4,128 freight equipment cars and 15 road service cars were condemned and destroyed during the year.

One café car was converted into a dining car and one chair car into a passenger coach. One combination, nine box and four gondola cars were assigned to road service. Seven baggage and mail cars were practically rebuilt in order to provide mail compartments that would conform to the Government requirements. 232 passenger equipment cars were painted and varnished and seven equipped with wide vestibules and standard steel platforms.

The total number of freight equipment cars in service at the end of the year was 42,801, having a capacity of 1,504,640 tons, an increase of 991 cars and 146,900 tons.

Traffic Expenses.—The expenditures under this heading, which have heretofore been included in Conducting Transportation, amounted to $778,652.95, an increase of $7,506.77 over the previous year, due largely to the expense of preparing and filing tariffs as now required under various laws.

Transportation Expenses.—The total cost of conducting transportation was $11,367,496.00, an increase of $218,294.61, or 1.96 per cent., as compared with the previous fiscal year.

The ratio of transportation expenses to total operating revenues was 32.01 per cent., as against 31.39 per cent. last year, an increase of .62 per cent.

The higher rates of wages paid employees, and the increased force made necessary by the enactment of federal and state laws, reducing the hours of labor, are the principal causes of the increase in these expenses.

General Expenses.—This item amounted to $574,006.37, an increase over the previous year of $58,079.02, due principally to the compliance by your company with recent laws passed by the United States Government and various states in which the company operates, that has made necessary additional clerical forces for the preparation of reports and the handling of communications with Commissions, as well as increased expenditures for legal advice in interpreting many of the laws and passing on questions incidental thereto.

Taxes.—The taxes during the year amounted to $1,122,867.39, or 3.16 per cent. of the company's revenues, an increase of $236,958.44, or 26.75 per cent. The increase in taxes levied and paid on your property during the last two years has been at so alarming a rate as to cause serious apprehension should the rate of increase continue. Many appeals have been taken from assessments which seemed unreasonable but with little success.

FINANCIAL.

To reimburse your company for previous cash outlays made for betterments and acquisitions of property $1,000,000 general consolidated mortgage 4 per cent. bonds were sold, leaving in the treasury $6,000,000 of these bonds available for future needs.

Expenditures for the completion of the Lehigh & Lake Erie Branch, including yard tracks and terminal facilities, were partially reimbursed by the sale of $1,000,000 Lehigh & Lake Erie Railroad Company 4½ per cent. bonds. The mortgage securing the same provided for an issue of $3,000,000 first lien bonds, all of which have now been sold. The remaining construction balance of $115,482.79 will be otherwise reimbursed at a later date in connection with such advance as may in the future be required for terminal improvements.

To partially provide for the cost of 4,000 steel coal cars and 1,000 steel underframe box cars, ordered during the previous year, an Equipment Trust, known as Series J, amounting to $5,000,000, and secured by the equipment mentioned, was created under date of October 3, 1907. The certificates bear interest at the rate of 4½ per cent. per annum, and are payable in semi-annual instalments of $250,000 each, the last instalment becoming due September 1, 1917. All of the certificates have been sold.

Payments amounting to $2,502,000 were made for the retirement of outstanding obligations, as provided in the respective mortgages or deeds of trust, and represent the matured principal of $1,000,000 collateral trust 4 per cent. bonds and of Equipment Trusts Series C, D, E, F, G, H, I, and J.

Hazleton Water Company first mortgage 5 per cent. bonds to the amount of $40,000 were received by your company, and are now held in the treasury, in settlement of advances made to that company for the construction and enlargement of its plant.

Your company during the year sold its holdings of the capital stock of the Wyoming Valley Coal Company to The Lehigh Valley Coal Company, receiving in payment therefor $350,000 in treasury stock of the latter company, which was pledged with the Trustee under the general consolidated mortgage.

The increase of $4,417,280.92 in Equipment Account is caused by the purchase of the 5,000 new steel cars covered by Equipment Trust Series J, as previously mentioned, less credits to that account representing the book value of certain small capacity cars disposed of in accordance with authority granted by your board and referred to in the last annual report. No other equipment was charged to Capital Account.

The increase of $219,434.57 in Real Estate Account is caused principally by an advance of $200,000 to one of your subsidiary real estate companies to pay off a mortgage of that amount on property in New York City, the same having previously been carried on the books at its cost price, less the amount of the outstanding mortgage. The balance of the increase is due to miscellaneous purchases during the year.

The value of materials and supplies on hand at the close of the fiscal year amounted to $2,104,196.72, an increase of $5,051.50.

The reserve for depreciation of Coxe mines and properties was reduced by $1,000,000, that amount having been applied to reduce the book value of the Coxe properties.

The sum of $228,635.61 was charged to Profit and Loss Account and represents certain taxes levied in past years which, after extensive litigation, the company was required to pay.

Current Assets are $10,338,818.98 in excess of Current Liabilities.

The amount of capital stock issued remains unchanged.

A semi-annual dividend of 5 per cent. on the preferred capital stock and a semi-annual dividend of 2 per cent., with an extra dividend of 1 per cent., on the common capital stock of the company, were declared by your board on December 18, 1907, and paid January 11, 1908. Similar dividends were declared on June 17, 1908, and paid July 11, 1908, making 10 per cent. and 6 per cent., respectively on the preferred and common capital stocks for the year.

The financial condition of the company at the end of the fiscal year is shown in the condensed general balance sheet and various statements appended.

The usual examination of the accounts for the fiscal year, as well as the verification of the cash and security balances of the company, has been made by certified public accountants, the result of which is set forth in the accountants' certificate published herewith

GENERAL REMARKS.

The operation of your company, in common with that of other railroads, has been subject to many adverse circumstances during the

year. The depression in the general business of the country that occurred at the end of the calendar year 1907, and which has since continued, seriously affected the revenues of the company and made necessary the suspension of all additions and betterments not required in the immediate conduct of its business. These improvements had been planned and were being prosecuted on an extensive scale prior to that time. Notwithstanding this your property has been fully maintained and is in excellent physical condition. The new classification of revenues and expenses promulgated by the Interstate Commerce Commission, effective July 1, 1907, destroyed in some measure, at a time when most needed, the comparison of operations with those of previous years. The order issued by that Commission requiring a uniform monthly charge for depreciation of equipment on a theoretical basis has also reduced the net results. In fact, to this radical departure in railroad accounting, as ordered by the Government, may be attributed the principal, if not the entire, reason for the increase shown in Operating Expenses over the preceding year. Previously it had been the policy of your company to prevent any shortage in its equipment by charging to expenses the value of cars or locomotives as destroyed or taken out of service, and this, with other charges, including appropriations from income as needed, provided a fund against which new equipment was charged from time to time with the result that your equipment as a whole has been more than maintained. In defense of the company's policy, if defense is necessary, it may be pointed out that the charges for replacement were heaviest when the equipment was most in use, when the earnings were therefore greatest, and consequently when the revenue was best able to sustain those charges, while on the other hand, the method prescribed by the Commission results in burdening the expense of operation with arbitrary charges during periods of business depression when much of the equipment is idle and earning nothing, as was the case in the latter part of the present fiscal year.

Further serious factors in the expense of operation are the higher rates of wages paid employees, and which are still in effect, the shorter hours of work and the cost of compiling reports as now required by various Commissions. In addition, the tendency of recent laws, both national and state, many of which were hastily enacted and ill-advised, has been in the direction of transferring to Commissions much of the authority over accounting and operating methods heretofore exercised by executive officers. Such laws must necessarily weaken that administration of the property which is so necessary to produce the high efficiency required for economical and safe operation, and, in the end, cannot bring about other than unsatisfactory and unfortunate results.

The double track terminal railroad at Buffalo, known as the Lehigh & Lake Erie Branch, was completed and placed in operation during the early part of the present fiscal year, together with the additional yard and terminal facilities at Tifft Farm, mentioned in the last annual report, the expenditures for the year being $709,407. These improvements, in addition to providing your company with a continuous double track line under its own control from the Great Lakes to the Atlantic Seaboard, enable the handling of a greater volume of lake and interchange freight economically and promptly, much of the same having previously been handled under trackage arrangements, the expense for which has now ceased.

The new yard with transfer bridges at the National Docks Terminal and the renewal of four transfer bridges at Jersey City, mention of which was made in last year's report, were completed and put in operation. The amount expended therefor was $571,168.

To avoid rebuilding the present wooden trestle on the high grade line at Greenville, a plan has been adopted providing for a permanent embankment and steel viaduct on a revised line and grade at an approximate cost of $450,000. Since the falling off in revenue the work has proceeded slowly, the expenditures to date being $77,254.

The work of stone ballasting was continued during the first half of the year and the entire main line, including the more important branches, is fully ballasted, with the exception of a limited mileage on Wilkes-Barre Mountain and at certain points where it is proposed at some future date to revise the line or put in additional tracks.

The construction of third and fourth tracks to a point east of Redington, mentioned in the preceding annual report, was completed at a cost of $481,835. A further extension of these tracks to Richards Farm, a distance of 2.1 miles, has been authorized, although the work is temporarily held in abeyance. Notwithstanding the additional third and fourth track mileage that has been added to the system in the last few years, the track facilities of your company, prior to the falling off in tonnage due to the recent general business depression, were taxed to the utmost, and, indeed, to an extent that forbade the most economical operation. Eventually your company should have a continuous four track line from the anthracite coal regions to tidewater, and with a return of normal business conditions it will be imperative that such extensions be made from time to time as the earnings of the company may warrant.

A second track, protected by automatic signals, was constructed between Van Etten and Van Etten Junction on the Ithaca Branch, at an expense of $10,852.

Additional automatic signals were installed between Van Rensselaer and Chicago Streets, Buffalo, and also between Black Creek Junction and Hudsondale, at a cost of $12,180.

For the purpose of consolidating shipments to and from New York Harbor and reducing the number of cars handled containing less than carload shipments, a new transfer platform and office, together with necessary tracks, were constructed at Oak Island, at a cost of $46,611.

A new brick freight house and a transfer shed were built at Sayre, and a new brick passenger station at Hazleton, the aggregate cost being $80,868. The passenger station at Hemlock was enlarged.

Improvements were made to the freight delivery yards at Jersey City, Newark, South Bethlehem and Rochester, consisting of grading, paving driveways, and additional tracks, the expenditures for the same aggregating $52,501.

The track entrance to the Scott Street Terminal, Buffalo, was improved by the reduction of grade and rearrangement of tracks, at an expense of $13,369.

Extensive repairs were made to the coal shipping trestle and the eastbound freight house at Tifft Farm, the total cost being $49,108.

A channel of sufficient width and depth to accommodate vessels to and from the National Stores was dredged, at an expense of $63,162.

To insure the safety of employees passing to and from the Sayre Shops, a concrete subway was constructed under the yard tracks, at an expense of $16,439.

The power facilities at Coxton and Sayre were improved; at the former by the erection of a modern plant and at the latter by the installation of four additional boilers and a new air compressor, the total cost of these improvements being $49,237.

There were located on your company's line during the year 36 new industries, direct track connections having been made with 23 of the same.

56.97 per cent. of the total operating expenses, including outside operations, or $13,921,371.94, was paid direct to labor, being distributed during the year among an average of 22,747 employees.

The acknowledgments of the Board are renewed to the officers and employees for their faithful and efficient services during the year.

By order of the Board of Directors.

E. B. THOMAS, President.

THE LEHIGH VALLEY COAL COMPANY.

The net earnings of The Lehigh Valley Coal Company for the fiscal year ended June 30, 1908, were $388,606.11, an increase of $277,355.66 over the previous year.

The total production of anthracite coal from the lands owned and controlled by The Lehigh Valley Coal Company and other companies in which it and the Lehigh Valley Railroad Company are interested through ownership of stock, was 9,263,899.02 gross tons for the fiscal year ended June 30, 1908, as compared with 8,867,254.18 tons for the previous twelve months, an increase of 396,644.04 tons, or 4.47 per cent.

The Lehigh Valley Coal Company and affiliated companies mined and purchased during the year 85.69 per cent. of the anthracite coal transported by the Lehigh Valley Railroad Company.

The operations of the Snow Shoe property produced 276,153.07 gross tons of bituminous coal, an increase of 88,763.04 tons, as compared with the preceding year.

The policy of extensive underground development of the coal lands for the purpose of not only maintaining the present tonnage, but materially increasing the same, together with the improvement of breakers, haulage and pumping plants and the coal mining machinery generally, was continued throughout the year. In addition, much has been accomplished in the matter of concentrating the various plants so as to produce the lowest possible cost of operation.

A new breaker is being constructed at Spring Mountain for the purpose of opening up additional territory in the Jeanesville coal lands and will be placed in service during the next fiscal year, the expenditures to date being $167,111. When completed, it is proposed to concentrate at that colliery the preparation of coal now handled at Spring Brook and Oneida, the breakers at these two points having reached a condition that will soon prevent further economical operation. Heidelberg No. 1 Breaker was enlarged and is now handling, in addition to its usual tonnage, the coal mined at Heidelberg No. 2 Breaker, the latter being unfit for further service. Hazleton No. 1 Breaker was rebuilt and enlarged during the year at an expense of $90,188 and on a basis that will permit of preparing an increased tonnage at a reduced cost. An underground electric haulage system was installed at Westmoreland Colliery in order to handle the increased output at that point. A new washery was erected at Prospect Colliery and another is now being built at Beaver Meadow.

The improvements already made, together with those now in progress, tend not only to offset the increased expense of mining incident to the greater depth of the workings and the longer underground haul, but also result in a greater percentage of prepared sizes of coal, the same having increased 9.38 per cent. in the last five years.

The new steel and concrete coal storage building and dock with necessary machinery for handling anthracite coal at Milwaukee, and a similar plant at South Chicago, replacing on a much larger scale one at that location destroyed by fire, as referred to in the last annual report, were completed in the early part of the year. The total cost of these plants, which have an aggregate capacity of 195,000 tons, was $795,976, of which $462,751 was charged to capital account and the balance to improvements and Reserve Funds.

The coal storage and shipping dock at West Superior was enlarged by the addition of an egg coal storage and handling plant.

New coal trestles and pockets were built at Geneva and at Syracuse.

The total additions and betterments made to the property during the year amounted to $755,129.40.

All of the capital stock of the Wyoming Valley Coal Company was acquired from the Lehigh Valley Railroad Company in the month of February, the latter receiving in payment therefor treasury stock of The Lehigh Valley Coal Company to the par value of $350,000. The property of the company thus acquired consists of about 1,400 acres of valuable coal lands held in fee or by perpetual lease. To effect the greatest economies in administration, the operations and accounts of that company, including the bonded indebtedness and net earnings from the date acquired, were merged with those of The Lehigh Valley Coal Company. This purchase further reduced the advances for coal mining rights and is the principal reason for the decrease in that account of $507,639.80, as compared with the previous year.

The sinking funds of the several mortgages have been fully maintained.

Respectfully submitted,

E. B. THOMAS, President.

Profit and Loss Account for the Year Ended June 30, 1908.

	Dr.	Cr.
Balance surplus, July 1, 1907	.....	$14,009,283.26
Dividends—		
5 per cent. on preferred stock, paid July 13, 1907 $5,315		
2 per cent. on common stock, paid July 13, 1907 806,696		
Extra 1 per cent. on common stock, paid July 13, 1907 403,348		
5 per cent. on preferred stock, paid January 11, 1908 5,315		
2 per cent. on common stock, paid January 11, 1908 806,696		
Extra 1 per cent. on common stock, paid January 11, 1908 403,348	$2,430,718.00	.....
Discount on general consolidated mortgage bonds and equipment trust certificates sold	450,000.00	.....
Taxes litigated applicable to prior years	228,635.61	.....
Miscellaneous adjustments	.....	21,665.11
Net income for year ended June 30, 1908 (Table No. 1)	.....	5,595,310.08
Balance surplus, June 30, 1908	16,516,904.84	.....
	$19,626,258.45	$19,626,258.45
Balance carried forward July 1, 1908	.....	$16,516,904.84

Comparative Income Account for the Years Ended June 30, 1908, and 1907.

Lehigh Valley Railroad Company.

	1908.	1907.	Inc. or *Dec.*
Revenue from operation:			
Coal freight revenue	$16,175,279.94	$15,270,213.84	$905,066.10
Merchandise freight revenue	14,011,301.78	14,864,262.21	*852,960.43*
Passenger revenue	4,159,890.47	4,326,118.87	*166,228.40*
Mail revenue	209,072.78	217,792.69	*8,719.91*
Express revenue	383,558.16	373,953.30	9,604.86
Other transportation rev.	290,232.18	239,180.57	51,051.61
Miscellaneous revenue	280,818.91	229,925.24	50,893.67
Total operating revenues	$35,510,154.22	$35,521,446.72	*$11,292.50*
Operating expenses:			
Maint. way and structures	$3,496,138.82	$3,344,181.89	$151,956.93
Maint. of equipment	5,987,410.64	6,186,873.82	*199,463.18*
Traffic expenses	778,652.95	771,146.18	7,506.77
Transportation expenses	11,367,496.00	11,149,201.39	218,294.61
General expenses	574,006.37	515,927.35	58,079.02
Total operating expenses	$22,203,704.78	$21,967,330.63	$236,374.15
Ratio, operating expenses to operating rev., per cent.	62.53	61.84	.69
Net operating revenue	$13,306,449.44	$13,554,116.09	*$247,666.65*
Taxes	1,122,837.39	885,908.95	236,958.44
Operating income	12,183,582.05	12,668,207.14	*$84,625.09*
Other income—Outside operations:			
Water lines	45,058.55	75,169.52	*30,110.97*
Other operations	43,469.97	80,604.06	*37,134.09*
Investments:			
Dividend on stocks	555,840.13	571,594.40	*15,754.27*
Interest on bonds	48,944.75	12,810.00	36,134.75
Int. on real estate morts.	17,034.12	18,113.46	*1,079.34*
Miscellaneous	810,670.36	856,699.51	*46,029.15*
Total other income	$1,521,017.88	$1,614,990.95	*$93,973.07*
Total income	$13,704,599.93	$14,283,198.09	*$578,598.16*
Deductions from income:			
Interest on funded debt	$3,536,060.00	$3,546,333.21	*10,273.21*
Int., equip. trust obligatns.	209,067.50	119,170.00	89,897.50
Rentals of leased lines and guarantees	2,316,473.00	2,200,473.00	116,000.00
Miscellaneous deductions	272,425.09	323,678.64	*51,253.55*
Additions and betterments	1,775,264.26	2,068,589.91	*293,325.65*
Total deductions, income	$8,109,289.85	$8,258,244.76	*$148,954.91*
Net income	$5,595,310.08	$6,024,953.33	*$429,643.25*
Lehigh Valley Coal Co.:			
Net income	388,606.11	111,250.45	277,355.66
Total net income	$5,983,916.19	$6,136,203.78	*$152,287.59*

Note.—*Decreases are in italic.*

Condensed General Balance Sheet, June 30, 1908.

Lehigh Valley Railroad Company.

Assets.

	Dr.	
Railroad—		
Cost of road	.....	$18,639,291.95
Equipment	.....	40,143,703.10
General consolidated mortgage bonds of the company held in its treasury	.....	6,000,000.00
Equipment trust certificates of the company held in its treasury	.....	4,050,000.00
Treasury stock	.....	250.00
General consolidated mortgage bonds of the company in hands of trustee of Warrior Run stock purchase bonds	.....	100,000.00
Real estate	.....	2,368,957.59
Construction Lehigh and Lake Erie branch	.....	115,482.79
Mortgages receivable	.....	300,150.00
Securities Owned—		
Stocks of railroad and water lines included in Lehigh Valley system.	$29,158,230.11	.....
Stocks of coal companies	18,881,068.33	.....
Stocks of other companies	5,692,550.00	.....
Bonds of railroad and water lines included in Lehigh Valley system.	4,372,926.00	.....
Bonds of other companies	3,303,907.87	.....
Certificates of indebtedness, the Lehigh Valley Coal Company	10,537,000.00	.....
		71,945,682.31
Advanced insurance premiums		127,964.56
Current Assets—		
Cash on deposit and in hands of treasurer	$6,195,059.65	.....
Cash in hands of officers and agents	25,738.65	.....
Cash in transit	542,695.52	.....
Freight and ticket agents' balances.	647,675.90	.....
Due by individuals and companies.	2,947,445.99	.....
Traffic balances due by other companies	406,272.92	.....
Bills receivable	732,203.00	.....
Advances to other companies	237,520.38	.....
Material and supplies on hand	2,104,196.72	.....
		13,838,808.73
Deferred and Suspended Assets—		
Sundry accounts	.....	380,559.96
Total assets	.....	$158,010,850.99

Liabilities.

		Cr.
Capital Stock—		
806,696 shares common stock, par $50	$40,334,800.00	.....
2,126 shares preferred stock, par $50	106,300.00	.....
		$40,441,100.00
Funded debt	.....	81,639,000.00
Equipment trust obligations	.....	10,062,000.00
Reserves—		
Reserve for depreciation of Coxe mines and properties	$1,209,360.06	.....
Equipment replacement reserve	573,804.15	.....
General reserves	1,155,397.08	.....
		2,938,561.29
Mortgages on real estate	.....	196,880.55
Interest, Rentals and Taxes Accrued, Not Due—		
Interest on funded debt	$720,135.00	.....
Interest on equipment trusts	88,762.50	.....
Accrued rentals, leased lines	421,985.82	.....
Taxes accrued	938,858.92	.....
		2,169,742.24
Current Liabilities—		
Dividends unpaid	$1,892.50	.....
Interest on funded debt due and unclaimed	51,615.75	.....
Rentals of leased lines due	337,500.00	.....
June payroll, since paid	963,570.93	.....
Audited vouchers, including June bills, since paid	1,175,753.97	.....
Due to individuals and companies.	134,013.47	.....
Traffic balances due to other companies	795,143.70	.....
Unclaimed wages	11,947.31	.....
Employees' relief fund	28,552.12	.....
		3,499,989.75
Deferred and Suspended Liabilities—		
Sundry accounts	.....	546,672.32
Profit and loss	.....	16,516,904.84
Total liabilities		$158,010,850.99

Note.—The dividends declared prior to the close of the fiscal year, and payable July 11, 1908, amounting to $1,215,359, are not included as a liability in the above statement.